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Personality, interest, and ability variables differentiated among California junior college students enrolled in occupation-centered curricula. Analytical techniques used were Stepwise Discriminant Analysis and Multivariate Analysis of Variance. Hawaiian students were differentiated on interest measures; Idaho students, on interest and personality factors. Apprentices appeared to be like currently enrolled students. There were some relatively small differences between students and graduates. Interests of Hawaiian students tended to be quite different from those in California. Significant differences in variance-covariance matrices indicated possible instability of factor structure underlying test scores of criterion groups. (Author)

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U.S. DEPARTMENT OF
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FINAL REPORT

Project No. 5-0152
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A STUDY OF CERTAIN CHARACTERISTICS OF STUDENTS AND GRADUATES OF OCCUPATION-CENTERED CURRICULA

Lawrence H. Stewart

University of California

Berkeley, California

June 1968

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L.H.S.

SUMMARY

Problem

Perusal of relevant literature indicates a serious lack of information concerning characteristics of junior college students enrolled in occupation-centered curricula. Such data are essential for a number of purposes--for counseling students who plan to enter trade and technical programs upon graduation from high school, for developing realistic selection procedures, for devising curricula which are responsive to the needs of students enrolled in them, and for extending current theoretical knowledge about the nature of occupational choice.

In 1966, the principal investigator published a pilot study of occupation-oriented students enrolled in one California junior college. The current study extends the pilot study to incorporate practically all curricula within California junior colleges and includes samples of students from two other states.

Procedures

Data were obtained by means of the Interest Assessment Scales (IAS), the Omnibus Personality Inventory (OPI), and a brief questionnaire designed to elicit biographical information. Data concerning achievement and academic aptitude were obtained from school records.

Complete data on the two inventories were obtained from three samples: students currently enrolled in 43 curricula, graduates of a number of the curricula who had entered a job related to their college education, and a small group of apprentices. In addition, IAS scores were collected from students enrolled in one Hawaiian community college. IAS scores and scores from a form of the OPI different from that used with California subjects were obtained from occupation-centered students enrolled in a number of Idaho colleges.

The data were analyzed primarily by means of stepwise multiple discriminant analysis and of multivariate analysis of variance.

Findings

Both the IAS and the OPI scales significantly discriminated among the California curriculum groups. While both instruments were effective, the IAS consistently classified more subjects into their respective curricula than did the OPI. The superiority of the IAS was evident in both California and Idaho samples.

The multivariate analysis of variance indicated that the profiles of mean scores differed significantly from curriculum to curriculum. Somewhat unexpectedly, the results from the H_1 test, the Wilk's test for equality of variance-covariance matrices, seemed to indicate that the factor structure underlying the IAS, and to some extent the OPI, varied from curriculum to curriculum. Also, this tendency was observed with the measures of academic ability.

When graduates were compared with currently enrolled students, significant differences in profiles of mean scores were observed for both the IAS and the OPI. The H_1 test was significant only for the OPI indicating possible differences in factor structure underlying the scores of the two groups. Apprentices appeared to be similar to current students with respect to mean scores on both instruments and with respect to the factor structure underlying the scores. With respect to IAS and OPI scores the two groups could be considered as a single sample.

Hawaiian subjects differed significantly from California students on profiles of mean IAS scores and possibly with regard to underlying factor structures. IAS scores significantly discriminated among the Hawaiian curriculum groups but not to the same extent as with California students. The IAS and a special form of the OPI also differentiated among Idaho students enrolled in several curricula. There were significant though small differences in profiles of mean IAS scores between Idaho and California subjects. The factor structure underlying the Interest scores of the two groups does not appear to differ.

Implications

That students enrolled in occupation-centered curricula can be differentiated so successfully by means of personality and especially of interest variables indicates that the selection of a curriculum by these subjects is a systematic and lawful process. Further study is needed in order to specify the nature of this process.

This study is merely descriptive of students preparing for a specific trade. It deals only to a limited degree with actual entry into the jobs. Comparison of only job entrants might well yield even sharper results.

The most perplexing findings of the study are the apparent differences from curriculum to curriculum and between California and Hawaiian subjects with respect to factor structure underlying the various instruments. If the factor structure does in fact vary as indicated, the current practices in the use of assessment instruments such as those employed in this study would be brought into question. This is a problem which needs further study.

INTRODUCTION

The Problem

The purpose of this research was to investigate differences in characteristics of junior college students enrolled in several trade and technical curricula. More specifically the objectives were to:

1) determine whether or not there are systematic differences in scores on personality and interest tests and in background factors among curriculum groups currently enrolled and
2) determine whether or not graduates of selected programs who obtain jobs related to their training are similar to those students who are currently enrolled.

Essentially this study was an extension of a pilot study of selected curriculum groups in one college (Stewart, 1966) to include all major trade and vocational curricula in several junior colleges throughout California and to compare results from selected California groups with similar subjects from Hawaii and Idaho.

Significance of the Problem

In the next several decades, trade and tehcnical training will become increasingly important in secondary schools and especially in junior colleges. This increase will be due, in large part, to technological advances resulting in jobs which require high level skills for entry. It will also be related to rapid changes in the labor market. By the late 1970's, the typical worker, particularly in a job vulnerable to automation, may expect to be "retreaded" or retrained several times during his working years. As the nature of jobs changes, an individual may have to modify his skills or he may need to be retrained for an entirely new type of job.

There is still another reason for the increasing importance of technical education--the imbalance between technicians and professionals. For example, it has been estimated that there is a need for three technicians for each graduate engineer (Williford, 1957). Yet a decade ago engineers were graduating at a ratio of about two for each technician (Holdeman, 1957). The number of engineering graduates is increasing rather rapidly. According to an editorial in the December 9, 1967 issue of School and Society, the number of engineering degrees awarded in 1966 represented an increase of 60 percent over 1956. It is doubtful that the engineer-technician ratio has been modified greatly in the last several years. As a matter of fact, the greatest increase in engineering graduates is at the doctoral level.

Perhaps the shortage of technicians is more serious than that of engineers. Many engineers are performing functions which could be carried out quite adequately by technicians--clearly a misuse of highly trained manpower.

The educational implications of changes in the job market have been outlined in the report of the President's Panel of Consultants on Vocational Education (1963). A major share of the responsibility for the initial training and retraining of semi-professional skilled personnel will fall to junior colleges. Because of their two-year patterns, their flexibility in program planning, and their responsiveness to the needs of their communities, they are particularly geared to provide education for much of the technical manpower needed in the labor force.

Even though the need for technical manpower and the role of the junior college in its education have been recognized for some time, it is of interest to note that most of the research in higher education has centered around students who attend four-year colleges and universities or junior college students who plan to transfer to such institutions. While students enrolled in occupation-centered curricula constitute a significant proportion of junior college enrollment, little is known about their characteristics, or about what happens to them once they leave the institution.

When students in an occupation-centered curriculum are enrolled without consideration of characteristics necessary for either success or satisfaction in the occupation for which the program is designed, the resources of the school and students are likely to be dissipated. Yet, at present, most schools have limited information upon which to base criteria for student selection. Observation indicates that some of the appraisal devices used by junior colleges have been validated against criteria quite different from those pertinent to a student in an occupation-centered curriculum. Furthermore, there is reason to doubt that tests which predict academic potential for success in a four-year college or university should make a significant contribution to predicting the success or satisfaction of a person in a semi-professional or skilled occupation. Yet some of the available data do indicate substantial correlations between traditional predictors and performance in occupation-centered courses. Linn and Davis (1962), for example, report a correlation of .35 between the Scholastic Aptitude Tests and Grade Point Averages for 250 career students at the Bronx Community College. Perhaps correlations such as these are reflections of teaching procedures rather than of the nature of the abilities required in the jobs for which the courses are preparatory.

There is little agreement in the literature about the type of person who should enter occupation-centered curricula. Available information is not based on research.

The present study does not seek to establish criteria for admission to various training programs. Neither is it concerned with job success subsequent to enrollment within a curriculum. However, it does provide important data on the nature of the students who are currently admitted to the various curricula and to a limited extent on graduates who enter jobs relevant to their training. If subsequent research should indicate that current students perform satisfactorily on the job, then the findings of a study such as the one described in this report add to the fund of knowledge on which sound admission criteria can be established.

In addition to the practical significance of this study, findings concerning relationships between personal characteristics and vocational decisions of students in occupation-centered curricula should have theoretical implications for the process of vocational choice. From observation it appears that, with the exception of programs such as those designed for electronic technicians, a student can enroll in a course of his choice as long as an opening exists; essentially, his freedom of choice is limited only by the offerings of the institution. Under such conditions, do students with somewhat similar characteristics tend to concentrate in certain areas of study? In a sense these occupation-oriented students provide an ideal population for studying the relationships between personal characteristics and the choice process. Selection procedures do not obscure existing relationships.

Related Research

Perusal of publications such as the Review and Synthesis of Research in Technical Education (Larson, 1966) indicates a considerable body of literature dealing with objectives and programs of occupation-centered curricula. As far as can be determined, there are few hard data about the characteristics of students who enter these curricula.

That vocational courses serve as "dumping grounds" for students who cannot hope to pursue a college curriculum is a commonly held opinion which may be based on fact in certain institutions. Stewart and Workman (1960) cited instances of faculty members in certain junior colleges who felt strongly that only students who could not make grades high enough to transfer to a four-year institution should be placed in technical and trade courses. Conant (1959) has expressed concern that poor students are being placed indiscriminately in vocational courses. He has suggested that students with IQ's below 90 not be placed in technical courses.

There is some evidence that the academic ability of students enrolled in technical and trade courses is lower on the average than that of four-year college students or of junior college students who plan to enter a four-year institution. Nevertheless, the range of ability in the occupation-centered curricula is about as great as that of the college and university groups (Clark, 1960; Medsker, 1960;

Thomte, 1961). Medsker reports that students enrolled in trade and industrial classes tend to fall predominantly in the IQ range of 90-109 (tests not specified); the IQ's ranged from below 70 in the high school courses to over 130 for junior college students.

Available evidence indicates a socio-economic bias in the choice of vocational courses. Both Clark and Thomte have shown that relatively more students in vocational courses come from low-status backgrounds than do students in transfer courses or in four-year institutions. Despite the existence of such biases, it is evident that students in vocational courses are quite heterogeneous in terms of academic ability and socio-economic background.

To determine whether the interest and personality characteristics of students in a particular occupation-centered curriculum are homogeneous, a pilot study was carried out in a California junior college in 1964 (Stewart, 1966). The results of this study indicated that the students in particular occupation-centered curricula did tend to have common characteristics. Although there was considerable overlap among the curriculum groups, they were sharply differentiated on the basis of a measure of interests; somewhat less differentiated on personality scores. Furthermore the interest and personality scores of these students were markedly different from those of students in predominantly transfer curricula. It appeared that psychological variables systematically enter into the choices of these occupational-oriented students.

The relative effectiveness of interest measures for differentiating community college students enrolled in career or transfer programs is further demonstrated in a pilot study conducted for the College Entrance Examination Board (Linn and Davis, 1962). The Academic Interest Measure scales were found to yield quite distinct profiles for students enrolled in three career programs--business, technologies, and nursing. As indicated previously, validities of the more traditional academic aptitude indices of academic performance were quite high for the career programs.

A great deal of research involving students in occupation-centered curricula is now in progress throughout the United States. The College Entrance Examination Board (CEEB) is conducting an experimental comparative guidance and placement program which will provide substantial data on these students. In cooperation with CEEB, related studies are in progress in Georgia, Washington, and Florida. Studies similar to the one described in this report are being conducted on a smaller scale by Kenneth Loudermilk in Idaho and by Yeuell Harris and his colleagues in Hawaii. Some of the data from the last two projects have been incorporated in this report.

Eventually Project Talent, initiated by John Flanagan in 1960, should provide significant information about students who enter occupation-centered programs. The study includes five percent of the high schools in the United States. Over a thousand bits of information--e.g., measures of special aptitudes, interests and temperament as well as data on activities, home background, and plans for the future--have obtained from each of 400,000 students in grades nine through twelve. These subjects will be followed up at intervals of one, five, ten, and twenty years. Eventually many of the students will enter occupation-centered curricula. Flanagan's study will yield the first baseline data of sufficient scope and number to permit meaningful long-range predictive studies.

Numerous predictive studies are being conducted within institutions. At the moment, however, it is difficult to determine the nature and extent of such research because dissemination agencies such as ERIC are not fully operational. Undoubtedly once the ongoing research has been completed and has been brought together, knowledge essential to making meaningful decisions about occupation-centered students will be greatly increased.

METHOD

General Procedure

The Interest Assessment Scales, selected scales of the Omnibus Personality Inventory, and a brief questionnaire were administered to three samples--students currently enrolled in occupation-centered curricula, apprentices attending evening classes as part of the requirements for attaining journeyman status, and selected graduates of occupation-centered curricula now employed in occupations related to those curricula. Except for one campus where subjects were asked to volunteer, students and apprentices were tested in intact classes. The study instruments were mailed to previous graduates. In addition, IAS scores were obtained from a sample of students enrolled in occupation-centered curricula in one Hawaiian junior college.* Also, IAS scores were obtained from students enrolled in several Idaho institutions.* Data from the OPI were available for Idaho subjects. However, since the form of the instrument was quite different from the one used with California subjects, the Idaho OPI data will not be analyzed in detail.

For California subjects, data concerning academic ability and academic achievement were obtained from student records.

Subjects

Several different samples have been used in this study. The California student sample included in the analysis consisted of 2,459 individuals currently enrolled in some 43 occupation-centered curricula. The subjects were obtained from 20 colleges located throughout California. The cooperating colleges and the students selected from each of them are indicated in Table 1. In order to include the full range of occupation-oriented students, both first and second year enrollees were included in the sample. Thus, since some subjects will undoubtedly drop out prior to graduation, findings may be less clearcut than if it had been possible to include only graduates. In all California samples only subjects providing complete data on the IAS and OPI were included. Approximately 700 subjects who failed to complete the two instruments were eliminated.

The nature of occupation-centered training in California colleges practically precludes the use of systematic or random sampling procedures. Typically, programs are established in relation to the needs of

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*The Hawaiian subjects were obtained through the cooperation of Drs. Yeuell Harris and Edith Doi of Kapiolani Community College; Idaho subjects through cooperation of Dr. Kenneth Loudermilk of the University of Idaho

TABLE 1

Study Subjects Currently Enrolled in Occupation-Centered Curricula

Accounting and Bookkeeping

San Jose City College	8
American River Junior College, Sacramento	7
San Francisco City College	1
Los Angeles Trade and Technical College	1
Bakersfield Junior College	12
San Diego City College	7
	36

Aeronautics

San Mateo Junior College	16
Fresno City College	29
	45

Air Conditioning and Refrig.

Laney College, Oakland	17
Los Angeles Trade and Technical College	53
San Joaquin Delta College, Stockton	5
	75

Aircraft Mechanic, Power

Laney College	14
San Mateo Junior College	25
Sacramento City College	11
	50

Aircraft Mechanic, Airframe

Laney College	9
San Mateo Junior College	28
Fresno City College	2
Sacramento City College	14
	53

Auto Mechanic

Laney College	7
Santa Rosa Junior College	51
Contra Costa Junior College, Richmond	12
Merritt College, Oakland	8
American River Junior College	1
Los Angeles Trade and Technical College	32
Modesto Junior College	6
Bakersfield Junior College	3
	120

Auto Body and Fender Repair

Laney College	10
Contra Costa Junior College	2
San Jose City College	1
American River Junior College	4
Los Angeles Trade and Technical College	14
Modesto Junior College	13
Fresno City College	16
	60

Building Construction (other than carpentry)

San Joaquin Delta College	33
Sacramento City College	20
	53

Business Equip. Tech.

Laney College	30

TABLE 1 (Cont.)

Cabinet Making (includes millwork)

Laney College	9
Los Angeles Trade and Technical College	46
Fresno City College	10
	65

Carpentry

Laney College	9
Los Angeles Trade and Technical College	31
Fresno City College	8
	48

Chemical Technology

Contra Costa Junior College	10
Merritt College	14
San Francisco City College	9
	33

Communications

Chabot College, Hayward	1
San Mateo Junior College	25
San Diego City College	5
	31

Cosmetology

Laney College	19
Contra Costa Junior College	18
San Jose City College	28
Los Angeles Trade and Technical College	42
San Joaquin Delta College	1
	108

Data Processing

Merritt College	22
Chabot College	20
San Mateo Junior College	11
American River Junior College	1
Bakersfield Junior College	3
San Diego City College	14
	71

Dental Assisting

Laney College	31
Contra Costa Junior College	14
San Jose City College	14
Modesto Junior College	1
	60

Dental Technology

San Francisco City College	29
Diablo Valley College	17
	46

Diesel

Laney College	19
American River Junior College	20
Los Angeles Trade and Technical College	17
Fresno City College	28
	84

Drafting, Architectural

Laney College	31
Contra Costa Junior College	5
San Francisco City College	9
Modesto Junior College	3
Fresno City College	9
Bakersfield Junior College	6
	63

Drafting, Industrial

Laney College	17
San Jose City College	19
Chabot College	7
San Mateo Junior College	40
Napa Junior College	12
Modesto Junior College	4
Bakersfield Junior College	2
	101

TABLE 1 (Cont.)

Dry Cleaning

Laney College	15
Los Angeles Trade and Technical College	9
	24

Electrical Technology

Laney College	5
Contra Costa Junior College	6
Los Angeles Trade and Technical College	25
Fresno City College	22
San Joaquin Delta College	12
	70

Electronic Technology

Laney College	70
Contra Costa Junior College	28
Modesto Junior College	2
Fresno City College	1
San Diego City College	16
	117

Engineering, Civil

Santa Rosa Junior College	18
San Francisco City College	9
Modesto Junior College	10
San Joaquin Delta College	13
	50

Fashion Arts

Laney College	37
Los Angeles Trade and Technical College	16
Modesto Junior College	1
Diablo Valley College	11
	65

Food Preparation and Service

Contra Costa College	10
Los Angeles Trade and Technical College	13
Modesto Junior College	13
Mesa Junior College, San Diego	21
	57

Forestry

Santa Rosa Junior College	20
American River Junior College	1
	21

Machinist

Laney College	21
Santa Rosa Junior College	7
San Jose City College	5
Chabot College	3
Los Angeles Trade and Technical College	13
Fresno City College	18
San Joaquin Delta College	16
Bakersfield Junior College	4
	87

Medical Assisting

Laney College	5
Contra Costa Junior College	14
San Jose City College	11
Chabot College	16
San Francisco City College	7
West Valley College, San Jose	19
	72

Registered Nurses

Contra Costa Junior College	32
San Francisco City College	19
	51

TABLE 1 (Cont.)

Licensed Vocational Nurses

Laney College	34
San Mateo Junior College	34
Modesto Junior College	1
	69

Photography

Laney College	11
San Francisco City College	12
Bakersfield Junior College	4
San Diego City College	12
	39

Plastics Technology

Los Angeles Trade and Technical College	15

Printing

Laney College	24
San Jose City College	2
Modesto Junior College	16
San Joaquin Delta College	9
	51

Radio and TV Repair

Los Angeles Trade and Technical College	21

Secretarial

San Jose City College	17
American River Junior College	12
San Francisco City College	38
Los Angeles Trade and Technical College	27
Fresno City College	12
Bakersfield Junior College	1
	107

Sheet Metal

Laney College	19
San Jose City College	5
Los Angeles Trade and Technical College	12
Fresno City College	6
San Joaquin Delta College	4
	46

Welding

Laney College	13
Contra Costa Junior College	6
Merritt College	10
San Jose City College	2
Chabot College	5
American River Junior College	3
Los Angeles Trade and Technical College	8
Modesto Junior College	4
Fresno City College	1
	52

X-Ray Technology

Merritt College	29
San Francisco City College	15
	44

Business Administration

San Jose City College	16
American River Junior College	2
Modesto Junior College	3
Bakersfield Junior College	13
San Diego City College	21
	55

Criminology

San Francisco City College	12
Modesto Junior College	29
Bakersfield Junior College	8
San Diego City College	21
	70

TABLE 1 (Cont.)

Fire Science	
San Francisco City College	12
San Diego City College	5
	17
Dental Hygienist	
Diablo Valley College	27

a particular locality or community. Any given institution may offer a rather limited number of programs. Thus in order to obtain students covering the broad range of curricula offered throughout the state, it was necessary to seek the participation of specific colleges. In a few popular programs such as electronics, it was possible to include subjects from several institutions; in other instances a program might be offered in only one or two colleges.

Initially 73 titles of curriculum programs were identified from the 1964 Directory of Occupation-Centered Curriculums. However, further investigation indicated that some of the curricula were not in operation at the time of the study and that frequently identical programs were offered under a variety of titles. The 43 curriculum groups used in this study represent practically all of the occupation-centered curricula with sufficient enrollment for meaningful analysis.

Two additional California junior college samples were obtained--samples of individuals who had made more than the tentative occupational committment indicated by student status in an occupation-centered curriculum. One sample consisted of graduates of several curricula who had entered occupations related to their junior college training. No attempt was made to sample systematically graduates of all curricula. Rather, a few curricula which had a fairly large number of graduates, which represented somewhat diverse types of training programs and for which graduates were easily identifiable were selected. The other sample was composed of apprentices who were attending college classes to satisfy requirements of their apprenticeship programs.

Identification of graduates and securing their cooperation turned out to be difficult undertakings. Although many of the colleges are now initiating follow-up studies of their graduates and are in the process of establishing data banks, surprisingly few of them now maintain information about their former students. In some instances, it was necessary to obtain names and addresses from instructors who had been instrumental in securing jobs for their students; in others, lists were obtained from the counseling office. Once graduates were identified, a letter was sent to them explaining the purposes of the study and soliciting their cooperation. The study instruments were mailed to those who agreed to cooperate. Altogether, letters were submitted to approximately 700 graduates; of these 260 returned cards indicating their willingness to complete the study instruments; 33, their unwillingness; 169 actually provided usable data. In addition it was possible to determine the current employment status of 100 subjects from the pilot project (Stewart, 1966). These subjects were included in the graduate sample described in Table 2.

The relatively low rate of responses obtained from graduates was probably due to a number of factors. For example, judging from the number of inquiries returned marked "addressee unknown," graduates are a rather mobile population. Also a number had taken occupations unrelated to their training. Others had entered four-year colleges for

TABLE 2

Study Subjects Previously Graduated from Occupation-Centered Curricula, Including Subjects from Pilot Study

Accounting	3
Aeronautics	8
Air Conditioning	5
Aircraft Mechanic	4
Auto Mechanic	10
Business Equipment Technology	3
Carpentry	5
Communications	1
Cosmetology	12
Data Processing	8
Dental Assisting	15
Diesel	33
Drafting	17
Electrical Technology	2
Electronic Technology	29
Fashion Arts	6
Machinist	6
Medical Assistant	7
Nursing, Registered	22
Nursing, Vocational	7
Photography	11
Printing and Publishing	1
Secretarial	9
Sheet Metal	7
Welding	6
Business Administration	29
Police Science	2
Fire Science	1
TOTAL	269

further training or had entered the armed forces. Furthermore, the lack of relevant data on graduates maintained by the junior colleges may be indicative of the rather tenuous ties developed between the graduate and the institution. If so, asking them to devote several hours to the rather difficult task of completing the study instruments in order to provide information of potential value to the institution would have little appeal. Subjects who cooperated were given their test scores.

An attempt was made to cover systematically apprenticeship classes in two colleges. However, because of opposition from a number of union advisory committees, several groups refused to cooperate. Apparently some of the unions, under severe criticism because of alleged discriminatory hiring practices, feared that somehow the results might be used to their detriment. The sample, consisting of 62 apprentices in two colleges is described in Table 3.

As mentioned previously, additional samples were obtained from Hawaii and Idaho. These samples will be described along with the findings based on the analyses of data obtained from them.

TABLE 3

Subjects Enrolled in Apprenticeship Classes

Aeronautics	13
Building Construction (Other than carpentry)	12
Carpentry	24
Licensed Vocational Nursing	13
TOTAL	62

Instruments

The Omnibus Personality Inventory (OPI) was designed by the Center for the Study of Higher Education for use with four-year college and university students. It was used for this study because several scales were found to be somewhat effective in the pilot study on which this research is based. Numerous studies conducted by the Center have demonstrated that the scales are highly reliable. The items, cast in a true-false format, emphasize "normal" aspects of behavior rather than neurotic symptoms and complaints characteristic of many personality inventories. The seven scales used in this study were obtained from a form of the OPI which had been adapted previously for use with high school subjects (Medsker and Trent, 1967). The descriptions of characteristics measured by these scales are as follows:

1. Autonomy (Au). The characteristic measured is composed of nonauthoritarian thinking and a need for independence. High scorers are non-judgmental, realistic, and intellectually liberal.

2. Complexity (Co). This measure relects an experimental orientation. Persons high on this scale tend to seek out and to enjoy diversity and ambiguity.

3. Estheticism (Es). High scorers tend to endorse statements indicating diverse interests in artistic matters and activities.

4. Impulse Expression (IE). This scale assesses a general readiness to express impulses and to seek gratification either in conscious thought or in overt action. High scorers tend to value sensations. Nine of the 75 items in this scale dealing mainly with sex habits and delinquent traits were omitted because they were deemed by the U.S. Office of Education to be potentially objectionable to subjects as an invasion of their privacy. Although these deletions should not materially reduce the scale's reliability, they should be kept in mind in comparing the results with other studies using the full length scale.

5. Social Introversion (SI). High scorers tend to withdraw from social contacts while low scorers tend to seek social contacts and to gain satisfaction from them.

6. Thinking Introversion (TI). Persons scoring high on this scale are characterized by a liking for reflective thought, particularly of an abstract nature. Low scorers show a preference for overt action and tend to evaluate ideas on the basis of their immediate application.

7. Theoretical Orientation (TO). This scale measures interest in scientific activities. High scorers are generally logical, rational, and critical in their approach to problems.

Of all the instruments used in the pilot study (Stewart, 1966) the Interest Assessment Scales (IAS) were most effective in differentiating the occupation-centered curriculum groups. The development of the IAS has been described by Ronning, Stellwagen, and Stewart (1963) and by Stewart and Ronning (1965). The eight subtests are as follows:

1. Adventure (Adv). A high score on this scale suggests a preference for activities of an adventurous and daring nature. These activities involve physical challenge and excitement.

2. Order (Ord). A high score on this scale indicates a preference for activities which can be dealt with in an orderly, systematic manner; an individual with a high score would probably enjoy situations where it is necessary to pay attention to detail. An example of a situation requiring such attention to detail might be writing programs for an electronic computer.

3. Influencing Others (Inf). A high score on this scale indicates a preference for activities through which one can influence others. Such influence might be expressed by being in a leadership position, by associating with important people, or by persuading others to carry out one's wishes.

4. Nurturance (Nur). A high score on this scale represents a preference for activities which demonstrate concern for the welfare of others--a desire to help the less fortunate.

5. Concrete Means (Concr). A high score on this scale indicates a preference for activities designed to achieve rather concrete ends--to design, to build, or to operate something. These preferences represent an applied orientation to problems.

6. Written Expression (Writ). A high score on this scale represents a preference for situations or activities which permit one to express his ideas through writing. The major concern is written expression, not the enjoyment or evaluation of the literary works of others.

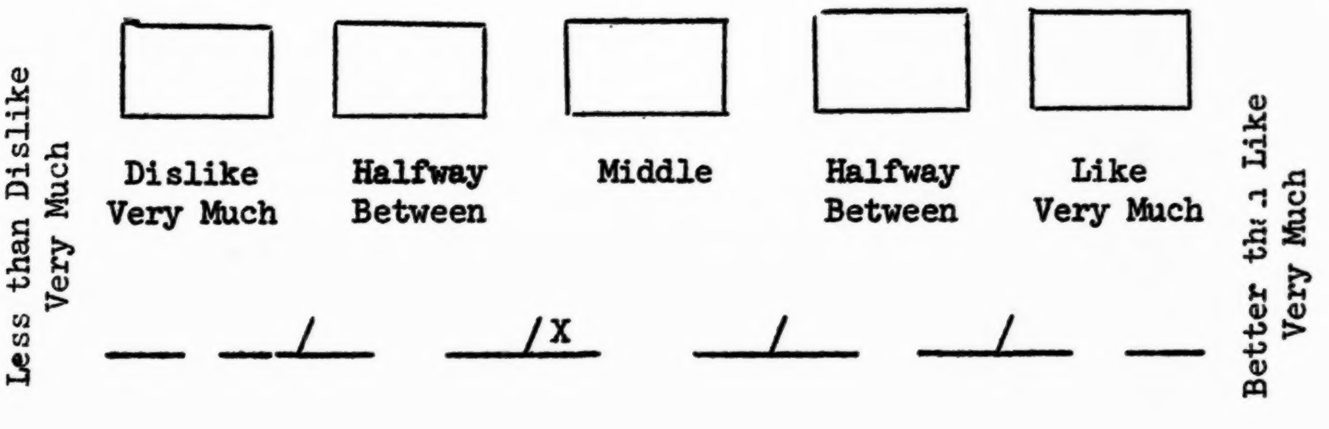
7. Abstract Ideas (Abst). A high score on this scale represents a preference for working with abstract ideas as opposed to the concrete application of ideas in Scale 5. A person with such a score might be relatively uninterested in the usefulness of the practical application of his ideas.

8. Aesthetic (Aes). A high score on this scale represents a preference for activities involving either the enjoyment of works of art or the production of such works.

Traditional measures of interests such as the Strong Vocational Interest Blank and the Kuder Preference Record are highly saturated with factors such as "interest in science" or "interest in business." In preparing a rationale for the Interest Assessment Scales the authors were persuaded that a person might be interested in the field of science for a wide variety of reasons--because it is orderly, because it provides an opportunity to work with gadgets or apparatus, because it would afford an opportunity to help one's fellow man, etc. The eight scales then represent an attempt to assess interest factors underlying a choice of any field of endeavor.

Since this test represents a departure from the typical measure of interests the format will be described in some detail. Each subtest contains one item from each of ten item domains within which interests might be expected to vary and which are typically included in interest inventories. Examples of these domains are: characteristics of close associates, college majors, and activities of a government mission overseas. Thus, each subtest consists of ten items.

Subjects were required to scale each item in a particular domain by an equisection procedure similar to that used by Gardner and Thompson in the development of their Social Relations Scales (1956). Consider the domain of college curricula as a paradigm. The subject was shown a normal curve pictograph and instructed to think of the pictograph as representing all college curricula with which he was acquainted. He was to consider the curricula as being normally distributed in terms of his preference; i.e., there are few curricula which he would either strongly like or dislike and many about which he would not have strong feelings one way or the other. He was then instructed to anchor his preferences as follows:



In the extreme right-hand box, he placed the name of the curriculum preferred over all others; in the extreme left-hand box, the one least liked; and so on until all boxes were filled.

The anchoring procedure constituted the first phase of the scaling. Then the eight items relating to college curricula were scaled relative to the continuum defined by a subject's anchors. Subjects were instructed to decide, in terms of their preference, in which half of the continuum an item belonged, in which quarter, and then to which box it was closer. The response to each item was marked as shown (X) below the boxes. A subject was completely free to place his response anywhere along the continuum. The entire procedure was repeated for each of the other nine item domains--domains such as use of free time, etc.

In the event that a stimulus item was liked or disliked more than the extreme anchors, an extra space was provided at each end of the continuum. Thus each item could be rated along a 10-unit scale, ranging from "Less than dislike very much" to "More than like very much." According to Torgerson (1958) this scaling procedure yields interval scales.

The items in each of the item domains have test-retest reliabilities (canonical correlations) ranging from .82 to .87 over a five-week interval. The product moment correlations for the total scores range in the high 70's and low 80's over the same time interval. Thus the reliability of the IAS scales compares favorably with those obtained from other interest measures. Evidence presented by Stewart and Ronning (1965) indicates that the subtest scores are related to the vocational plans of subjects. Also scores on the experimental scales were highly correlated with scores on conventional measures of interest: The Strong Vocational Interest Blank and the Kuder Preference Record.

Previous research has indicated that the IAS scales are relatively independent of scales on the OPI. As a further check on the relationship between the two instruments, the scores obtained from the currently enrolled student sample used in this study were intercorrelated. Since the scales within the IAS or within the OPI are not independent of each other, canonical analytical procedures were used.

In canonical analyses, the two sets of scores, i.e., OPI and IAS, are weighted so as to indicate the maximum degree of relationship between them. As the first correlation probably does not indicate all the ways the data are related, a second correlation, orthogonal to the first, is computed and so on until all significant relationships have been shown. Actually, in the current analysis, the number of obtained correlations equals the smallest number of variables in either instrument--in this case the seven OPI scales.

The canonical correlations are shown in Table 4. The first correlation appears to be rather high, but one must remember that canonical correlations provide maximum estimates of relationships. Product moment correlations between the scales of two instruments are shown in Table 5. With few exceptions these correlations are very low.

Analyses of Data

A number of multivariate analyses including stepwise discriminant analysis and multivariate analysis of variance were used. The specific procedures will be described in some detail along with the appropriate findings. As indicated previously, only subjects providing complete data on the IAS and OPI scales were included in the various analyses.

TABLE 4

Canonical Correlations Between OPI and IAS Scores
(N 2454)

Canonical	Correlation
1	.69
2	.61
3	.46
4	.37
5	.32
6	.15
7	.07

TABLE 5

Product-Moment Correlations Betwen IAS and OPI Scales
(N 2454)

	Adv.	Detail	Influ.	Nurturance	Concrete Means	Written Expr.	Abst.	Aes.
AU	-.0905	-.2736	-.0906	-.1082	-.0964	.0531	.1511	.0679
CU	.1327	-.2198	-.0510	-.1113	-.0069	.0509	.1685	.1522
ES	-.0849	.0601	.1349	.2505	-.1659	.4129	.2435	.5475
IE	.3124	-.1537	.0600	-.1967	.1063	-.0337	.0983	.0825
SI	.0465	-.0535	-.3094	-.2392	.0920	-.2265	-.1302	-.1661
TI	-.1424	.1102	.2334	.2475	.0034	.4679	.5045	.3062
TO	.0470	.0372	.1277	.0032	.2797	.2049	.5773	.1328

FINDINGS--INTEREST ASSESSMENT SCALES

Stepwise Discriminant Analyses

The first concern in the data analysis is the effectiveness of the IAS for classifying students enrolled in occupation-centered curricula. The procedure appropriate to this type of problem is stepwise discriminant analysis. Discriminant analysis weights the components of a profile of scores in such a manner that maximum separation is obtained among criterion groups. The profile of scores, converted to a discriminant score, provides an estimate of a subject's position on a plane that best separates the groups. The percentages correctly classified into the respective criterion groups, and the percentages of dispersions among criterion groups accounted for (U-Statistic) by the predictor variables, are of most interest in this study.

Frequently more than one discriminant function is required to account for the ways in which a test battery separates criterion groups. These different functions are orthogonal to one another. In this study only the first two functions were of most concern since, typically, these two functions account for a major part of the discriminating power of the IAS and the OPI.

The stepwise feature of discriminant analyses is a procedure for determining the relative contribution of each variable or score to the discrimination among the criterion groups. This type of analysis provides a potential basis for eliminating from the predictor battery variables which do not add to the discrimination. It also adds valuable information about the nature of criterion groups. The entire procedure indicates not only that the groups can or cannot be discriminated by means of the predictor variables, but also which variables most effectively discriminate among them.

Criterion Groups Based on an Internal Criterion

The discriminant analyses in which all 43 curriculum groups were included yielded rather ambiguous results. Although the discriminations on the basis of IAS scores were significant, as can be seen in Table 6, the number of correct classifications was indeed rather small --ranging from zero to 46 percent. The overlap among the groups was so great that differences among specific curricula tended to be obscured. Therefore, in order to reduce the number of comparisons, some procedure for combining curriculum groups on the basis of their similarity on interest scores was required. The procedure which seemed most appropriate for combining the criterion groups was Tryon's Cluster Analysis. This technique clusters the groups on the basis of the Euclidian distances among their mean scores on the scales included in the prediction battery.

TABLE 6

Discrimination Among 43 Curriculum Groups-
Percentage of Subjects Correctly Classified

Name of Curricula	No. of Cases Classified	Total Number of Cases	Percentage Classified
Accounting/Bookkeeping	5	36	14
Aeronautics	12	45	27
Air Conditioning	0	75	--
Aircraft Mechanic, power	0	50	--
Aircraft Mechanic, airframe	4	53	7
Auto Mechanic	0	120	--
Auto Body and Fender Repair	0	60	--
Building Construction	5	53	9
Business Administration	24	55	44
Business Equipment Technology	6	30	20
Cabinet Making	3	65	5
Carpentry	0	48	--
Chemical Technology	4	33	12
Communications	5	31	16
Cosmetology	4	108	4
Criminology (Police Science)	4	70	6
Data Processing	0	71	--
Dental Assisting	6	60	10
Dental Hygienist	3	27	11
Dental Technology	21	46	15
Diesel	1	84	1
Drafting, Architectural	10	63	16
Drafting, Industrial	11	101	11
Dry Cleaning	1	24	4
Electrical Technology	0	70	--
Electronic Technology	28	117	24
Engineering, Civil	1	50	2
Fashion Arts	30	65	46
Fire Science	4	17	23
Food Preparation and Service	0	57	--
Forestry	4	21	19
Machinist	0	87	--
Medical Assisting	22	72	31
Nursing, Registered	4	51	8
Nursing, Vocational	25	69	36

TABLE 6 (Cont.)

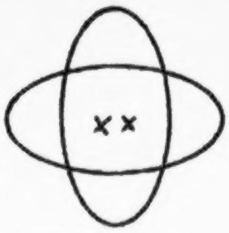
Photography	0	39	--
Plastics Technology	1	17	7
Printing and Publishing	0	51	--
Radio and TV Repair	0	21	--
Secretarial	22	107	20
Sheet Metal	1	46	2
Welding	0	52	--
X-Ray Technology	10	44	23

Forming criterion groups on the basis of predictor variables is generally to be avoided. Yet as Friedman and Rubin (1967) suggest, in the absence of explicit external criteria with which to define criterion groups, an experimenter may need to accept tentatively external criteria derived from the data. But the problem with the analyses used in this study is not that all subjects were pooled and then subjects selected on the basis of interest scores alone. The basic unit remains the choice of curriculum in external criteria. The Tryon procedure merely reduces the number of comparisons by combining curriculum groups with similar interest profiles. It is likely that the grouping procedure will tend to increase the discrimination achieved by predictor measures. Therefore, additional comparisons will be carried out among a priori and among empirically derived criterion groups.

Possible objections to the use of the Tryon procedure for combining curriculum groups hold only for analysis across clusters. Within-cluster analyses compare groups based solely on an external criterion--choice of curriculum.

Five clusters were obtained from this analysis. These are shown in Table 7. The degree to which there is similarity in mean scores of the curricula in the various clusters can be seen in Figures 1 through 5.

As far as the means of the curriculum groups are concerned, the Tryon procedure achieved fairly homogeneous clusters. Unfortunately, however, the clustering procedure does not take variance into account. Even though the two means may coincide in discriminant space, the discriminant scores may be distributed in the following manner:



Therefore it is quite possible that the interest scales could discriminate among curriculum groups included in a given cluster. Actually this did happen within each of the clusters. The results of the stepwise discriminant analyses within the clusters are shown in Tables 8 and 9. Since scales identified in the first three or four steps account for most of the dispersion among the criteria, only the results for four steps are shown.

Perhaps the U-Statistic provides the best measure of the relative effectiveness of the various scales for discriminating among criterion groups. One minus the U-Statistic indicates the proportion of the dispersion matrix attributable to each variable.* In Table 8, for example,

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* See Appendix A for computational formulas.

TABLE 7

Clustering of Curriculum Groups on Basis of IAS Mean Scores--Tryon System

Cluster I - Personal Service

Curriculum
- Dental Assistant
- Secretarial
- Dental Hygienist
- Fashion Arts
- Food Preparation
- Nursing, Registered
- Medical Assistant
- Cosmetology
- Dry Cleaning
- X-Ray Technology
- Nursing, Vocational

Cluster II - City Service

- Policemen
- Firemen

Cluster III - Construction

- Air Conditioning
- Building Construction
- Carpentry
- Welding
- Drafting, Architectural
- Printing and Publishing
- Sheet Metal
- Radio and TV Repair
- Dental Technology
- Accounting
- Electronics Technology

Cluster IV - Business

- Business Administration
- Communications
- Plastics Technology
- Data Processing
- Photography
- Chemical Technology
- Business Equipment Tech.

Cluster V - Machines

- Machinist
- Aircraft Mechanic, power
- Auto Body
- Engineering, Civil
- Diesel
- Drafting, Industrial
- Aeromautics
- Electrical Technology
- Auto Mechanic
- Aircraft Mechanic, airframe
- Forestry
- Cabinet Making

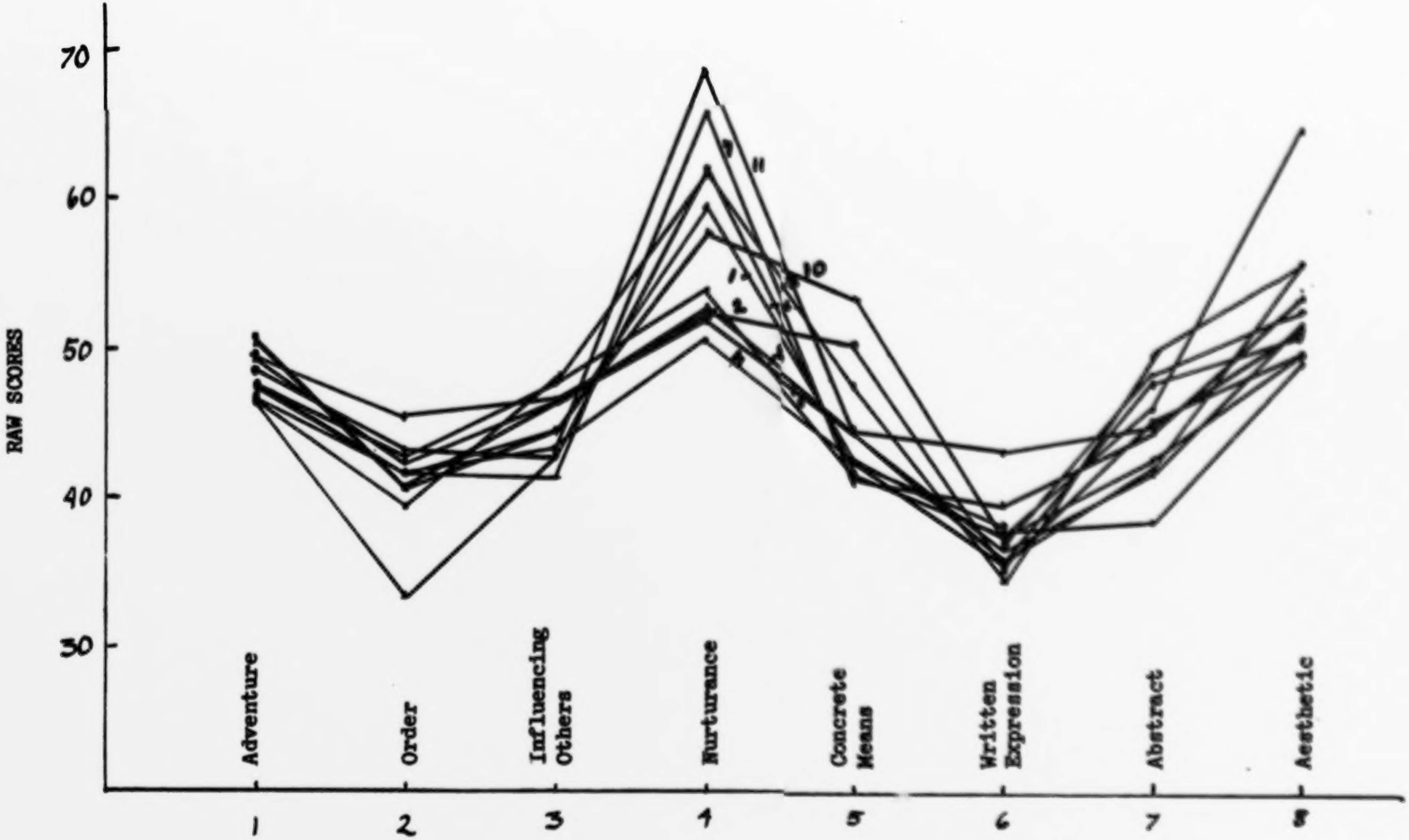

Fig. 1 Plot of mean IAS raw scores for curricula within Tryon Cluster I (Numbers on plots refer to order in which curricula are listed in Table 7.)

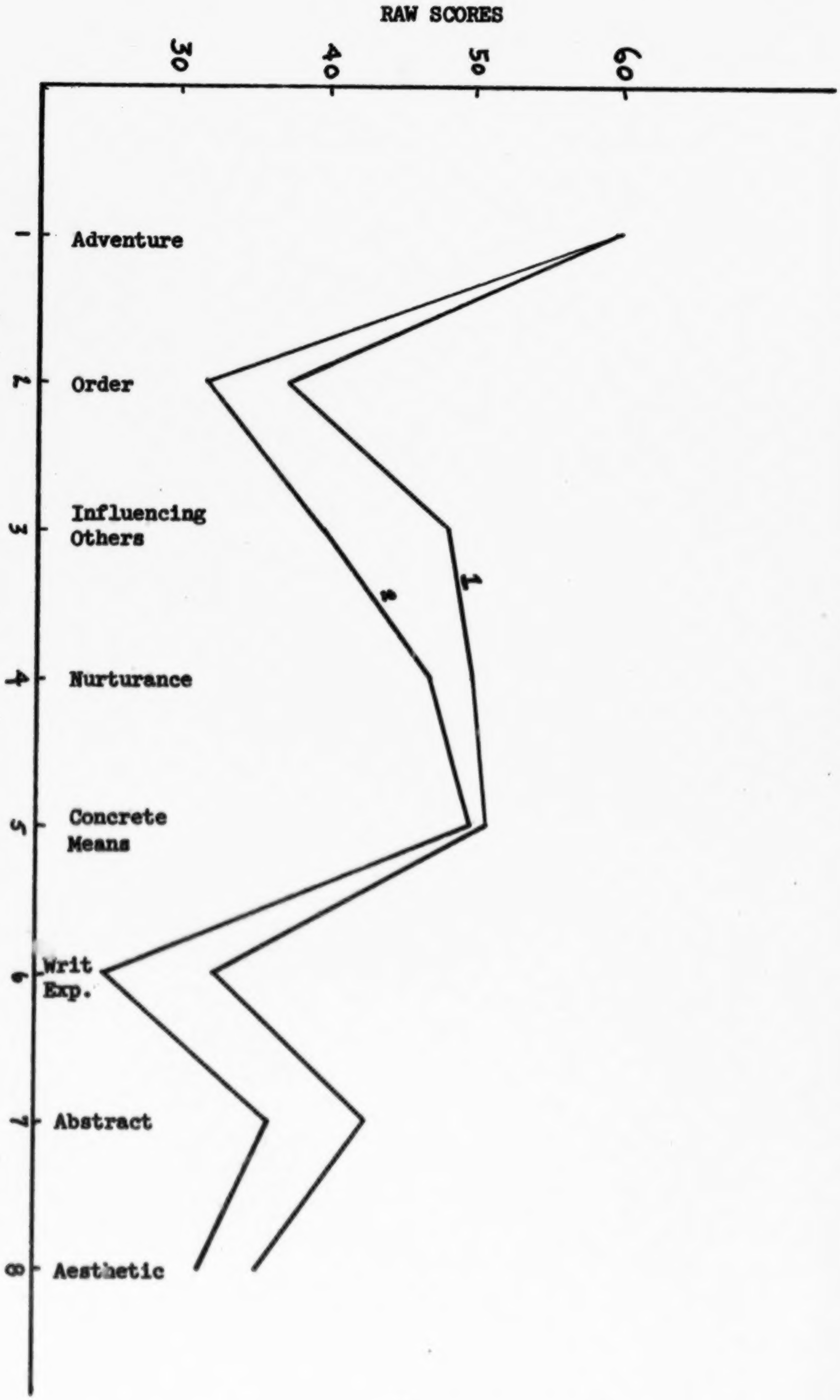

Fig. 2 Plot of mean IAS raw scores for curricula in Tryon Cluster II

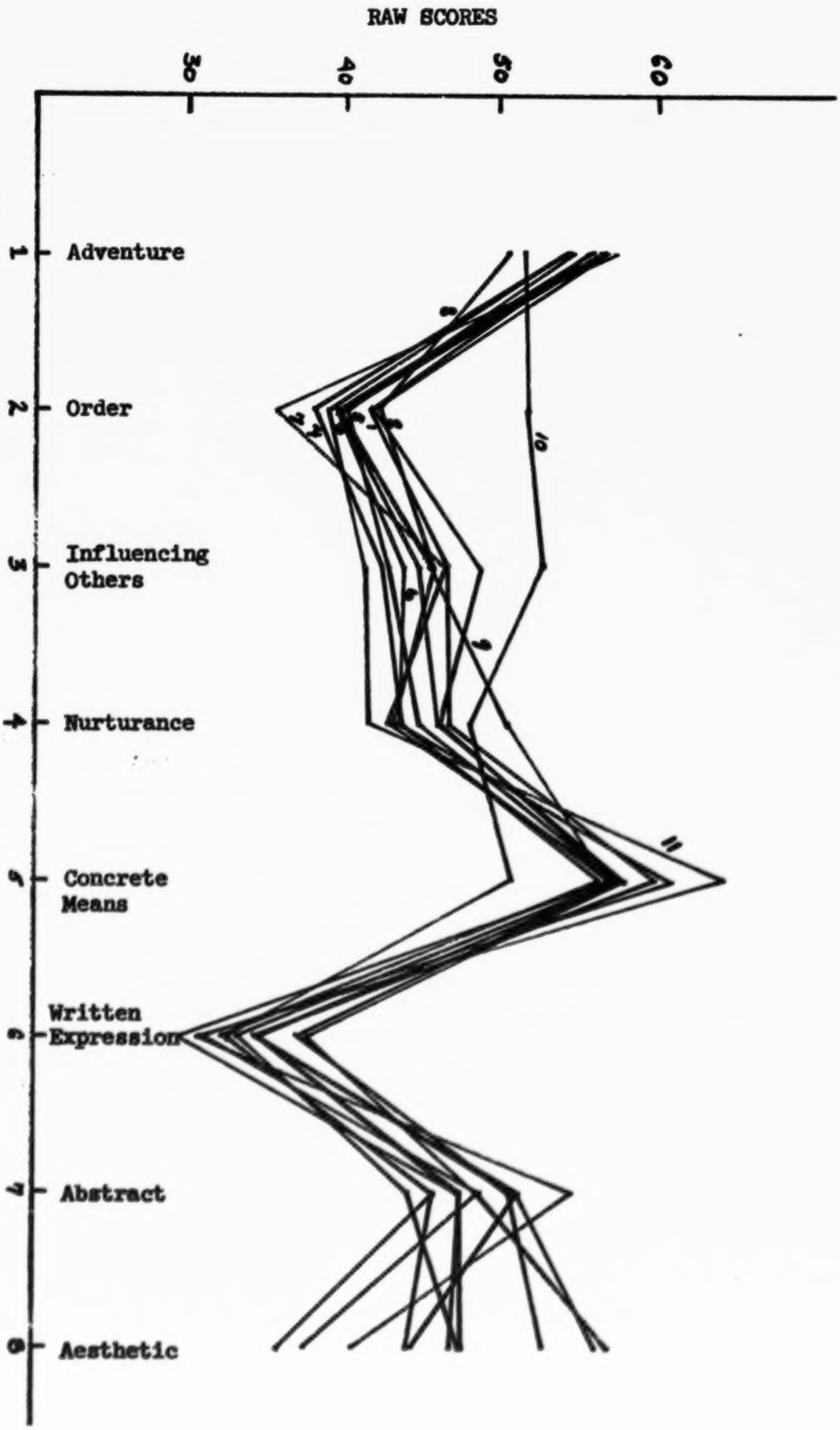

Fig. 3 Plot of mean IAS raw scores for curricula in Tryon Cluster III

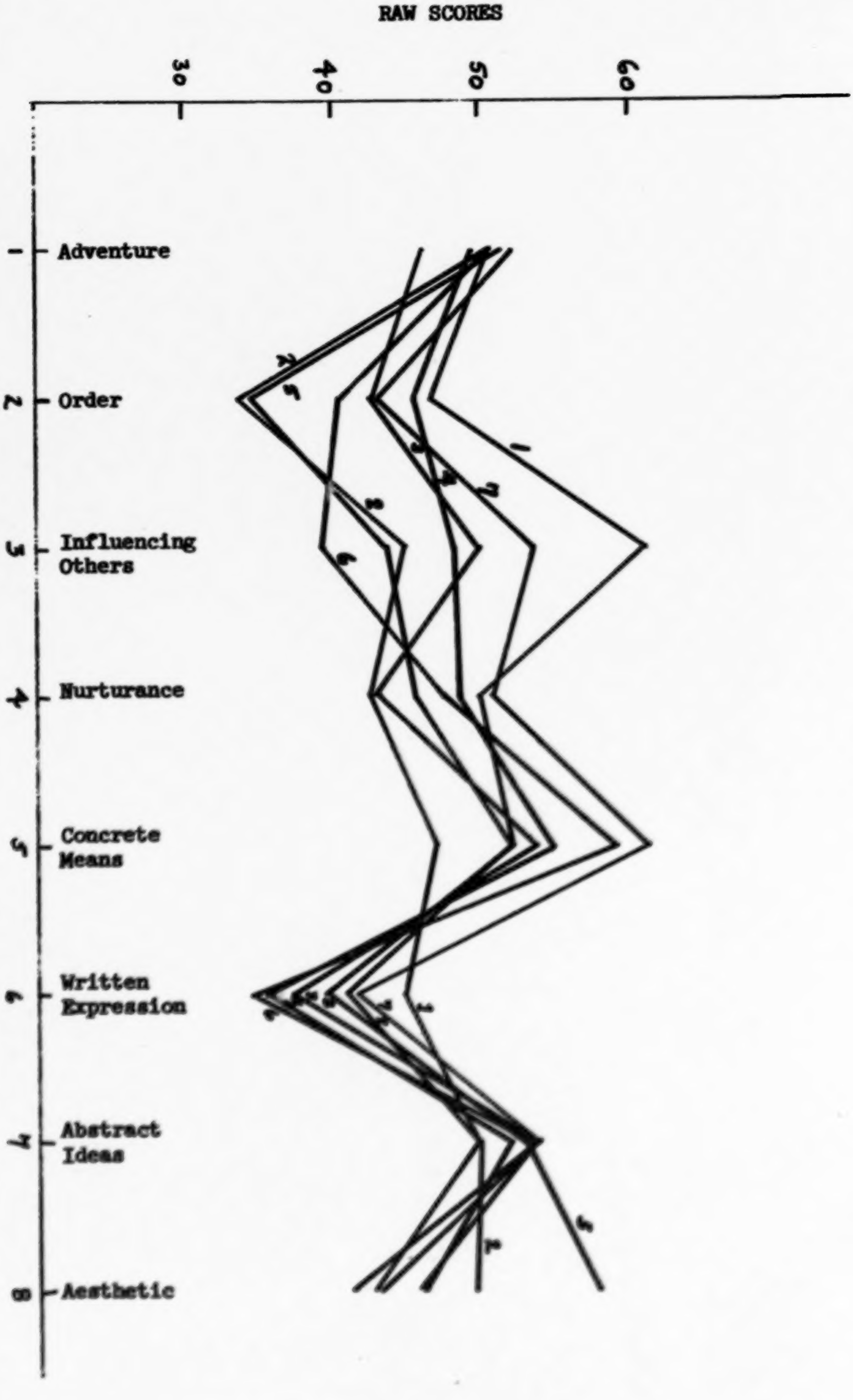

Fig. 4 Plot of mean IAS raw scores for curricula in Tryon Cluster IV

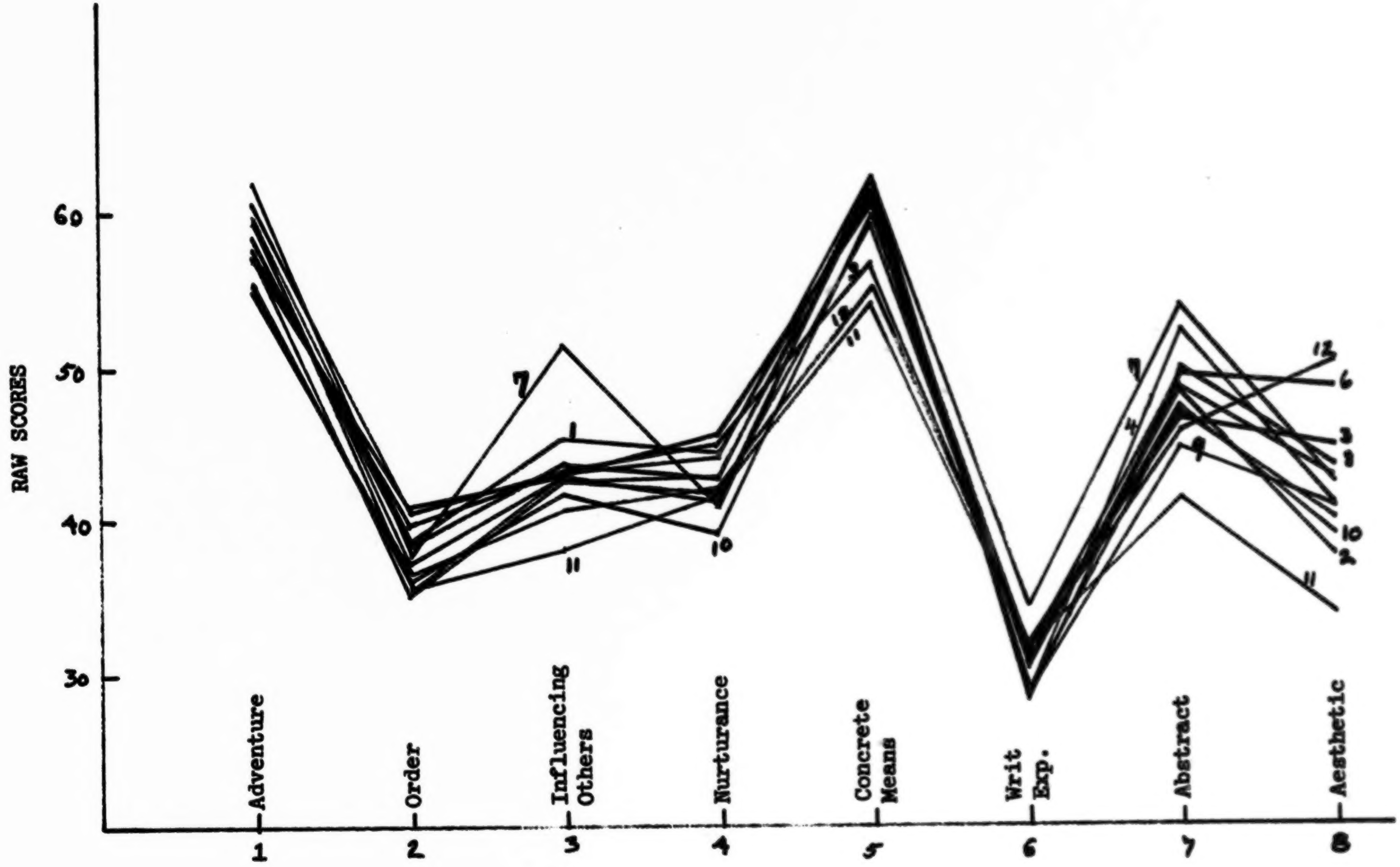

Fig. 5 Plots of mean IAS raw scores for curricula in Tryon Cluster V

TABLE 8

Summary of Stepwise Analyses of the IAS Scores Within Tryon Clusters

	Step Number	Variable	F-Value	U-Statistic
Cluster I				
	1	Nurturance	20.88	.76
	2	Concrete Means	8.23	.68
	3	Influencing Others	7.55	.61
	4	Aesthetic	6.83	.55
Cluster II				
	1	Influencing Others	5.61	.94
	2	Concrete Means	.87	.93
	3	Abstract Ideas	1.19	.92
	4	Order	.42	.91
Cluster III				
	1	Aesthetic	10.08	.86
	2	Order	7.82	.76
	3	Concrete Means	10.93	.64
	4	Abstract Ideas	4.08	.60
Cluster IV				
	1	Influencing Others	15.83	.74
	2	Concrete Means	7.49	.63
	3	Order	5.02	.57
	4	Written Expression	4.99	.51
Cluster V				
	1	Aesthetic	5.48	.93
	2	Concrete Means	4.12	.88
	3	Abstract Ideas	3.69	.84
	4	Order	3.32	.80

TABLE 9

Subjects Correctly Classified by IAS Scores Within Clusters Formed by Tryon's Procedure

Cluster I

Curriculum	Total Number of Cases	Number of Cases Classified	Percent of Cases Classified
Dental Assisting	60	7	12
Secretarial	107	34	31
Dental Hygienist	27	5	19
Fashion Arts	65	40	62
Food Preparation	57	2	4
Nursing, Registered	51	5	10
Medical Assisting	72	22	31
Cosmetology	108	3	3
Dry Cleaning	24	8	33
X-Ray Technology	44	21	48
Nursing, Vocational	69	23	33

Total Correctly Classified 170
Total Percent Classified 25

Cluster II

Police	70	45	64
Firemen	17	12	71

Total Correctly Classified 57
Total Percent Classified 66

Cluster III

Air Conditioning	75	6	8
Building Construction	53	5	9
Carpentry	48	0	0
Welding	52	3	6
Drafting, Architectural	63	14	22
Printing & Publishing	51	10	20
Sheet Metal	46	8	17
Radio & TV Repair	21	7	33
Dental Technology	46	12	26
Accounting & Bookkeeping	36	26	72
Electronic Technology	117	51	44

Total Correctly Classified 142
Total Percent Classified 23

TABLE 9 (Cont.)

Cluster IV

Business Administration	55	33	60
Communications	31	11	35
Plastics Technology	15	5	33
Data Processing	71	21	30
Photography	39	6	15
Chemical	33	18	55
Business Equipment Technology	30	14	47

Total Correctly Classified - 108
Total Percent Classified - 39

Cluster V

Machinist	87	0	0
Aircraft Mechanic Power	50	7	14
Auto Body & Fender Repair	60	5	8
Engineering, Civil	50	3	6
Diesel	84	13	15
Drafting, Industrial	101	22	22
Aeronautics	45	9	20
Electrical Technology	70	6	9
Auto Mechanic	120	17	14
Aircraft Mechanic	53	1	2
Forestry	21	11	52
Cabinet Making	65	23	35

Total Correctly Classified - 118
Total Percent Classified - 15

the Adventure Scale accounts for 24 percent of the dispersion matrix for Cluster I. Concrete Means, Influencing Others, and Aesthetic account for an additional 11 percent.

Differences in homogeneity within the clusters are readily apparent. The IAS scores accounted for little of the dispersions in Clusters II and V. For the other clusters, approximately one-fourth of the dispersion was accounted for by one of the IAS scales.

The percentages of subjects correctly classified are shown in Table 9. Within each cluster there was a considerable amount of variation in the number classified for each curriculum group. Also, overall there were marked differences from cluster to cluster. Only 15 percent of those in Cluster V were correctly classified; 66 percent, in Cluster II. It should be noted that there were only two groups included in Cluster II; therefore, better differentiation was to be expected. If the Tryon procedure had achieved homogeneous criterion groups, then no or little discrimination would have been expected.

The obtained clusters based on IAS scores are of interest in and of themselves. For example, most of the criterion groups containing predominantly female subjects were included in Cluster I. Some groups which on the surface appeared to be similar fell into different clusters. Dental assistants and hygienists were included in Cluster I. Dental technologists were included in Cluster III along with such curricula as architectural drafting, carpentry, welding, accounting and electronics technology. It is of interest to note that while electronics technology fell in Cluster III, electrical technology fell in Cluster V along with various types of mechanics, industrial architects, and civil engineers. Policemen and firemen formed a cluster by themselves.

The relative effectiveness of the IAS scales for differentiating among the five clusters is shown in Table 10. Two scales, Concrete Means and Nurturance, accounted for 28 and 19 percent of the dispersion, respectively. The Aesthetic and Adventure scales combined accounted for only an additional five percent.

As shown in Table 11, the IAS was not equally effective for classifying students in all curriculum clusters. The percentage correctly classified varied from 27 percent for Cluster III to 74 percent for Cluster I. For all clusters combined, 47 percent were correctly classified into their respective clusters.

The plot of the mean IAS raw scores for each of the five clusters is shown in Figure 6. Even though there are differences among the vectors of means for the clusters, there are general trends which characterize the entire sample. All clusters tend to have relatively high mean scores on the Adventure and Concrete scales. Their mean scores on Detail and Written Expression tend to be low. The plots of the discriminant scores for the first two functions, Figure 7, further

TABLE 10

Summary of Stepwise Discriminant Analyses of the IAS Scores Among Tryon Clusters
(Four Steps Only)

Variable	F-Value	U-Statistic
Concrete Means	238.37	.72
Nurturance	214.28	.53
Aesthetic	34.53	.51
Adventure	30.13	.48

TABLE 11

Percentage of Cases Correctly Classified When Compared Across IAS Clusters

Total IAS Cluster	Total Number of Cases	Number of Cases Classified	Percent of Cases Classified
I	684	503	74
II	87	53	61
III	608	165	27
IV	274	77	28
V	806	362	45

Total Correctly Classified	1160
Total Percent Correctly Classified	47

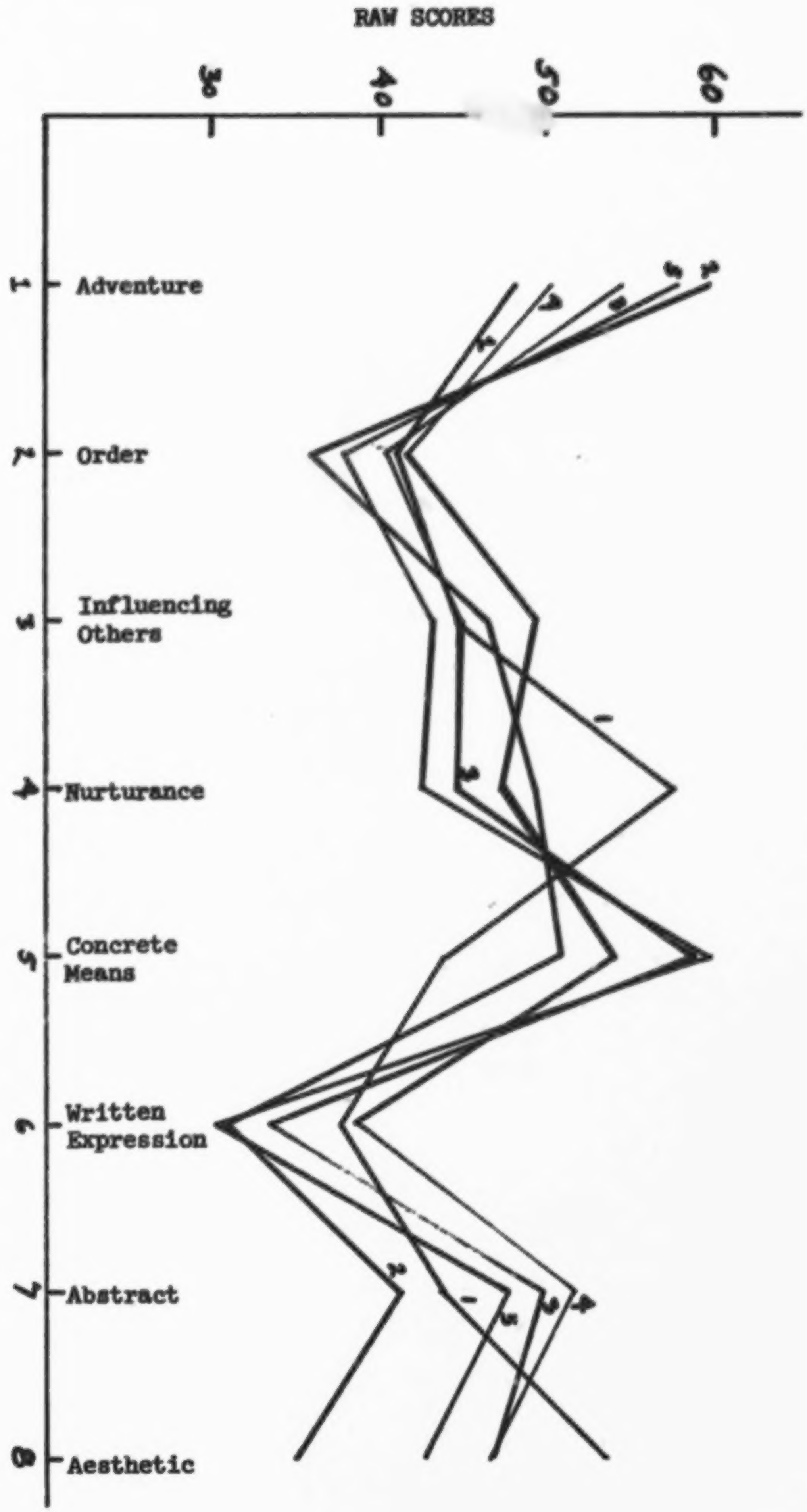

Fig. 6 Plots of mean IAS raw scores for the Tryon Clusters

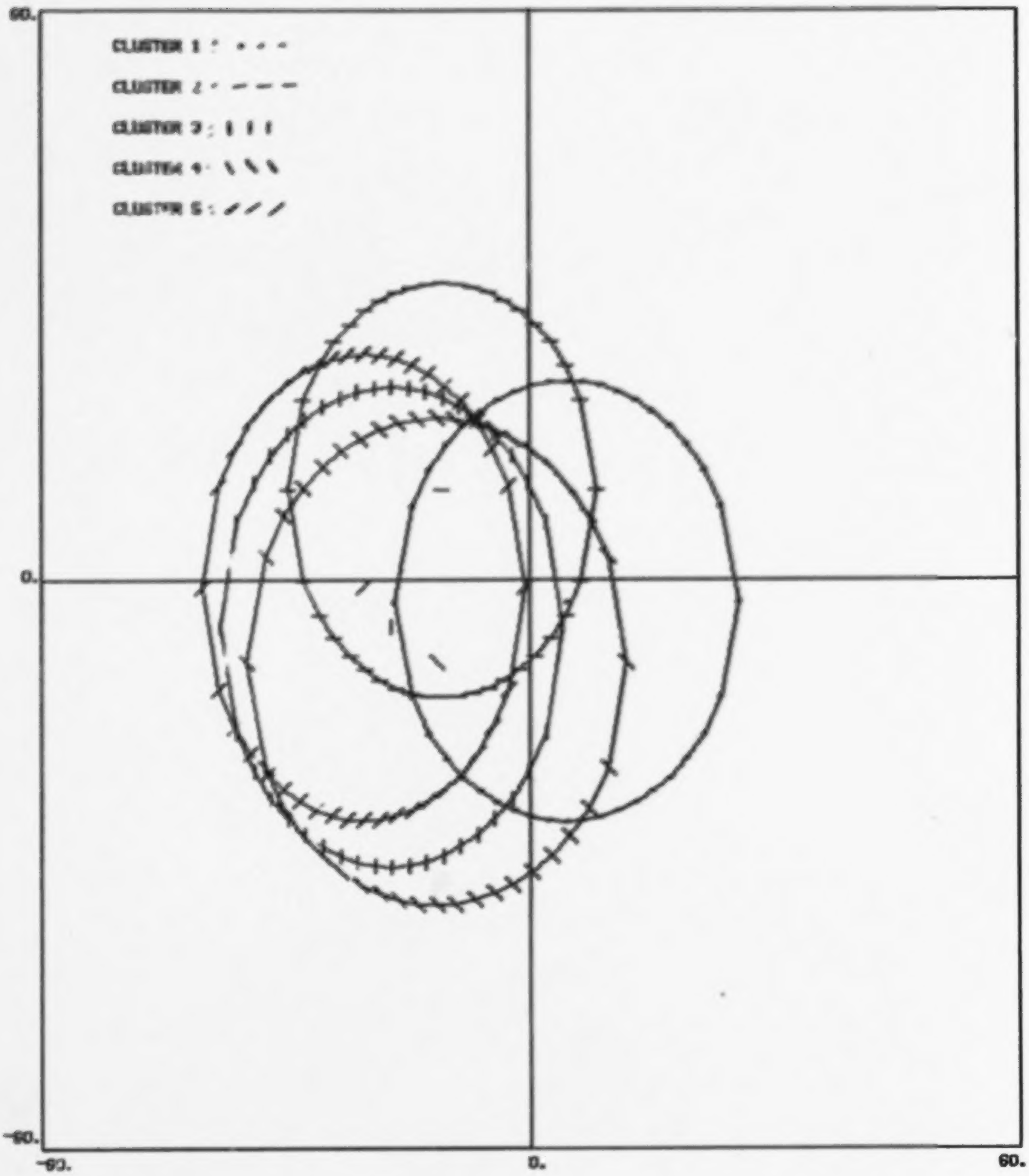

Fig. 7 - Plots of IAS discriminant scores for Tryon clusters.

indicate the amount of overlap among the clusters when the clusters were classified according to IAS scores.

Figure 7 was constructed by plotting the means of the discriminant scores (centroids) and their standard deviations for function I against those of function II. The plot includes plus and minus two standard deviations. The total degree of discrimination is seriously underestimated by the plot, since only the first two functions--albeit the most important ones--are shown. Also the plot can be shown only in a two-dimensional plane. It should be remembered that the discriminant scores should be visualized as a swarm with more than two dimensions. The plot represents cross sections through the ellipsoids at the densest part. The cross sections are then forced into a single plane further distorting the degree of separation.

A Priori Criterion Groups

In the discussion of the Tryon clusters, concern was expressed over the use of internal criteria for forming comparison groups for purposes of analyzing differences among these groups. In this section, data relative to the effectiveness of the IAS scales for differentiating among an *a priori* classification of curricula will be presented.

Perhaps the real value of these instruments lies in their ability to predict membership in the *a priori* criterion groupings. Such groupings provide a basis for many administrative and instructional decisions of importance to students. Frequently such classifications are not based on objective information. If the IAS scales differentiate among these *a priori* groups, the knowledge should help define the nature of such classifications and should be relevant to decisions concerning them.

Using criteria such as those which might be employed by a practicing counselor, the investigator sorted the 43 curricula into seven groups as shown in Table 12. Factors taken into account in the sorting process included mainly the socio-economic level of jobs for which the curriculum was designed and the type of work to be performed. For this analysis no effort was made to attain consensus with ratings made by others. It is interesting to note, however, that there was considerable agreement with sortings made by two other members of the project staff. In one instance, there was disagreement in the placement of only one curriculum; in the other, disagreement was primarily in terms of number of groups, not in placement of curricula with respect to each other.

The results of a stepwise discriminant analysis of the IAS scores among the *a priori* criterion clusters are shown in Tables 13 and 14. Fifty percent of the dispersion among the seven clusters was accounted for by four IAS scales. Aesthetic accounted for 25 percent; Abstract Ideas for 19 percent; and Written Expression and Nurturance, for an

TABLE 12

A Priori Classification of Curriculum Groups

Cluster I

Forestry
Criminology
Fire Science

Cluster II

Cosmetology
Dry Cleaning
Fashion Arts
Food Preparation/Service

Cluster III

Dental Assisting
Dental Technology
Medical Assisting
Nursing, Registered
Nursing, Vocational
X-Ray Technology
Dental Hygienist

Cluster IV

Air Conditioning
Airpower Mechanic
Airframe Mechanic
Auto Mechanic
Auto Body/Fender
Diesel
Machinist
Sheet Metal
Welding

Cluster V

Aeronautics
Business Equipment Technology
Chemical Technology
Drafting, Architectural
Drafting, Industrial
Electrical Technology
Electronic Technology
Engineering, Civil
Photography
Plastics Technology
Radio-TV Repair

Cluster VI

Accounting/Bookkeeping
Communications
Data Processing
Printing/Publishing
Secretarial
Business Administration

Cluster VII

Building Construction
Cabinet Making
Carpentry

TABLE 13

Summary of Stepwise Discriminant Analysis of IAS Scores Among A Priori Curriculum Clusters (First Four Steps Only)

Variable	F-Value	U-Statistic
Aesthetic	134.7	.75
Abstract Ideas	143.5	.56
Written Expression	28.0	.52
Nurturance	14.4	.50

TABLE 14

Percentage of Cases Correctly Classified by Means of IAS Among *A Priori* Curriculum Clusters

Cluster	Total No. of Cases	No. of Cases Classified	Percent of Cases Classified
I	108	45	42
II	254	84	33
III	369	236	64
IV	627	174	27
V	584	230	39
VI	351	109	31
VII	166	19	11

Total Number Classified	897
Total Percent Classified	37

additional six percent. The percentages of the various clusters correctly classified (Table 14) varied from eleven to 64 percent. Thirty-seven percent of the subjects over-all were correctly classified into their respective clusters.

As was to expected, the proportion of the total subjects correctly classified into the Tryon clusters (47 percent) was greater then 37 percent obtained for the *a priori* groupings. Still, the fact that almost four out of ten occupation-oriented students can be so classified suggests strongly that their choice of curriculum tends to be related systematically to the students' psychological characteristics and that interests are important components of such characteristics.

The plots of the IAS discriminant score for the *a priori* clusters are shown in Figure 8. Note the seemingly high degree of overlap. But these plots suffer from the same distortions indicated in the discussion of the plots for the Tryon clusters.

For the reader who may be interested in the relative homogeneity, in terms of IAS scores, of the occupations within each of the *a priori* clusters, the results of stepwise multiple discriminant analyses among the curricula are shown in Tables 15 and 16. There was considerable variation overall in the percentages correctly identified. Also the order in which the IAS scales differentiated the criterion groups in the several clusters and the amount of dispersion accounted for by these scales varied considerably from cluster to cluster. Perhaps the most homogeneity was obtained in Cluster IV.

Empirical Criterion Groups

A third method of clustering the 43 curricula was devised in the following manner. The names of the curricula were placed on cards. Eighteen counselors, nine of them currently employed in a junior college, were asked to sort the cards. The other counselors were enrolled in a graduate research seminar. Each counselor was asked to sort the curricula according to any scheme which made sense to him. The only prohibition introduced was that sex should not be a relevant variable. A matrix of tallies was made indicating the frequency with which each curriculum was grouped with each of the other 42. This confusion matrix was then analyzed by means of the Tryon clustering procedure used previously with the mean scores.

As shown in Table 17, nine clusters emerged. On the whole, the clusters produced by this procedure appear to be quite logical. Curricula which seemed least appropriately placed were cosmetology, printing and publishing, and dry cleaning in Cluster V; food preparation and fashion arts in Cluster VII; and perhaps air conditioning in Cluster II.

The results of a stepwise discriminant analysis of IAS scores across the empirical clusters are shown in Tables 18 and 19. The per-

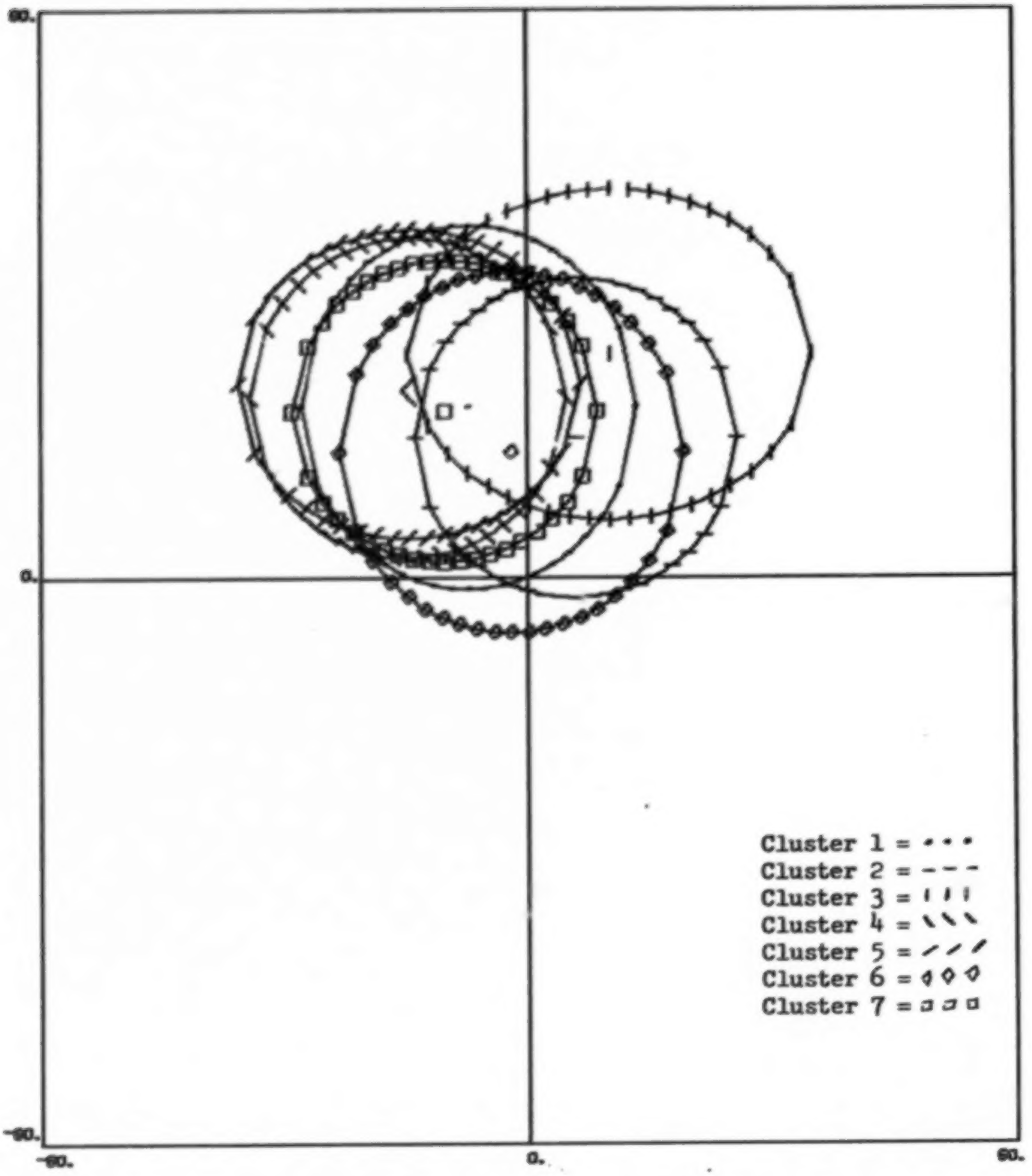

Fig. 8 - Plots of IAS discriminant scores for A Priori clusters.

TABLE 15

Subjects Within *A Priori* Clusters Correctly Classified by IAS Scores

	Total Number	Number of Cases Classified	Percent of Cases Classified
Cluster I			
Forestry	21	11	52
Criminology	70	36	51
Fire Science	17	8	47
Total Classified		55	
Total Percent Classified		51	
Cluster II			
Cosmetology	108	24	22
Dry Cleaning	24	16	67
Fashion Arts	65	43	66
Food Preparation and Service	57	12	21
Total Classified		95	
Total Percent Classified		37	
Cluster III			
Dental Assisting	60	23	38
Dental Technology	46	27	59
Medical Assisting	72	18	25
Nursing, Registered	51	20	39
Nursing, Vocational	69	19	28
X-Ray Technology	44	11	25
Dental Hygienist	27	5	19
Total Classified		123	
Total Percent Classified		33	
Cluster IV			
Air Conditioning	75	15	20
Airpower Mechanic	50	16	32
Airframe Mechanic	53	2	4
Auto Mechanic	120	25	21
Auto Body/Fender	60	11	18

2

TABLE 15 (Cont.)

Cluster IV (Cont.)				
Diesel	84		18	21
Machinist	87		2	2
Sheet Metal	46		14	30
Welding	52		6	12
Total Classified		109		
Total Percent Classified		17		
Cluster V				
Aeronautics	45		17	38
Business Equip. Tech.	30		8	27
Chemical Technology	33		13	39
Drafting, Architectural	63		18	29
Drafting, Industrial	101		13	13
Electrical Technology	70		2	3
Electronics Technology	117		40	34
Engineering, Civil	50		5	10
Photography	29		17	44
Plastics Technology	15		4	27
Radio-TV Repair	21		2	10
Total Classified		139		
Total Percent Classified		24		
Cluster VI				
Accounting/Bookkeeping	36		12	33
Communications	31		13	42
Data Processing	71		11	15
Printing/Publishing	51		21	41
Secretarial	107		63	59
Business Administration	55		33	60
Total Classified		153		
Total Percent Classified		44		
Cluster VII				
Building Construction	53		27	51
Cabinet Making	65		31	48
Carpentry	48		17	35
Total Classified		75		
Total Percent Classified		45		

TABLE 16

Summary of Step-Wise Analyses of IAS Scores Within A Priori Clusters

	Step No.	Variable	F-Value	U-Statistic
Cluster I				
	1	Influencing Others	5.98	.90
	2	Concrete Means	3.69	.84
	3	Written Expression	2.24	.80
	4	Nurturance	2.97	.76
Cluster II				
	1	Aesthetic	9.98	.89
	2	Concrete Means	6.01	.83
	3	Adventure	1.20	.82
	4	Abstract Ideas	.91	.81
Cluster III				
	1	Concrete Means	19.38	.76
	2	Nurturance	18.17	.58
	3	Order	4.86	.54
	4	Influencing Others	2.91	.51
Cluster IV				
	1	Concrete Means	2.67	.97
	2	Abstract Ideas	3.66	.92
	3	Aesthetic	2.92	.89
	4	Order	2.57	.86
Cluster V				
	1	Aesthetic	9.43	.86
	2	Concrete Means	6.79	.77
	3	Influencing Others	7.19	.68
	4	Nurturance	4.65	.63
Cluster VI				
	1	Concrete Means	21.13	.77
	2	Influencing Others	16.61	.62
	3	Nurturance	12.02	.52
	4	Order	8.45	.47
Cluster VII				
	1	Influencing Others	6.54	.93
	2	Aesthetic	1.05	.91
	3	Nurturance	.89	.90
	4	Concrete Means	.45	.90

TABLE 17

Empirical Clusters from Confusion Matrix

Cluster 1

- Dental Assistant
- Dental Hygienist
- Dental Technician
- Registered Nurse
- Vocational Nurse
- Medical Assistant
- X-Ray Technician
- Photographers

Cluster 2

- Accountant
- Business Administration
- Secretary
- Data Processing

Cluster 3

- Cabinet Making
- Carpentry
- Building Construction

Cluster 4

- Airframe Mechanic
- Airpower Mechanic
- Aeronautics
- Auto Mechanic

Cluster 5

- Electronic Technician
- Electrical Technician
- Business Equipment Technology
- Chemical Technician
- Plastics Technician
- Cosmetology
- Printing and Publishing
- Dry Cleaning

Cluster 6

- Industrial Draftsman
- Architectural Draftsman
- Civil Engineering

Cluster 7

- Policeman
- Fireman
- Forestry
- Food Preparation and Service
- Fashion Arts

Cluster 8

- Welding
- Sheet Metal
- Machinist
- Auto Body/Fender
- Diesel

Cluster 9

- Radio-TV Repair
- Communications
- Air Conditioning

TABLE 18

Percentage of Subjects Correctly Classified by IAS Scores Across Empirical Clusters (43 Curricula)

Cluster	Number	Number Classified	Percent Classified
I	408	254	62
II	269	109	41
III	166	34	20
IV	268	127	47
V	448	25	06
VI	214	67	31
VII	230	48	21
VIII	329	23	07
IX	127	7	06

Total Classified	694
Total Percent Classified	28

TABLE 19

Summary of Step-wise Discriminant Analysis Across Empirical Clusters - IAS Scores
(43 Curricula)

Step	Variable	F-Value	U-Statistic
1	Nurturance	80.9	.79
2	Concrete	75.7	.63
3	Influence	21.9	.59
4	Aesthetic	11.4	.57

centage correctly classified varied from 62 for Cluster I to 6 for Clusters V and IX. Overall, only 28 percent were classified, considerably less than the 37 percent so classified when the IAS scores were analyzed according to the a priori clusters or to the 47 percent achieved with the Tryon clusters.

Is it possible that the relatively poor showing of the IAS scores in discriminating among the empirical clusters was due to the fact that six curricula did not seem to belong logically with their respective clusters? To check on this possibility, the scores were reanalyzed omitting these curricula. The results are shown in Tables 20 and 21. Actually the percentage classified by this procedure increased only to 32.

Thus, it would seem that both the a priori and Tryon clusters were more sharply discriminated by the IAS scores than were those empirically derived from counselor sorts. However, the over-all percentage correctly classified across the empirical clusters is still quite high for an interest inventory.

Although the information obtained is somewhat redundant, stepwise discriminant analyses were performed within the respective empirical clusters (six curricula removed). These analyses simply show relationships among occupations not considered together in the previous clustering procedures. The results are presented in Tables 22 and 23. The percentages correctly classified within each of the clusters tend to be somewhat higher than the percentages obtained with the Tryon or a priori clusters, indicating that the empirical clusters are less homogeneous with respect to interests.

Analyses of Vectors of Means

Criterion Groups Based on Internal Criteria

Are the profiles of mean scores on the eight scales of the IAS significantly different among the criterion groups within the clusters formed by the Tryon procedure? Among the clusters? As discussed in the Stepwise Multiple Discriminant section, the fact that the Tryon clusters were based on an internal criterion raises serious questions about the meaning of a cross-cluster comparison. Nevertheless, these comparisons are included because they help define the nature of the clusters.

Multivariate analysis of variance (MANOV) used to analyze relationships among profile mean scores of the various criterion groups, provides tests of two hypotheses. H_1 is the Wilk's (1948) test for equality of variance-covariance matrices. Equality of covariance is a sufficient condition for equality of factor structure of tests from sample to sample. An insignificant F-ratio would mean that the factor structure of the OPI or IAS is similar for the curriculum groups. On the

TABLE 20

Percentage Classified Across Empirical Clusters--IAS Scores (Six Curricula Omitted)

Cluster	Number	Number Classified	Percent Classified
I	408	260	64
II	269	97	36
III	166	39	23
IV	268	78	29
V	265	67	25
VI	214	62	29
VII	108	40	37
VIII	329	9	03
IX	52	7	13

Total Number Classified	659
Total Percent Classified	32

TABLE 21

Summary Discriminant Analysis of IAS Scores Across Empirical Clusters (Six Curricula Omitted)

Step	Variable	F-Value	U-Statistic
1	Nurturance	86.1	.75
2	Concrete	82.3	.60
3	Influence	22.7	.52
4	Aesthetic	23.4	.48

TABLE 22

Percentage Correctly Classified Within Empirical Clusters--IAS Scores (Six Curricula Omitted)

	Number	Number Classified	Percent Classified
Cluster I			
Dental Assistant	60	17	28
Dental Hygienist	27	5	19
Dental Technologist	46	19	41
Registered Nurse	51	20	39
Vocational Nurse	69	18	26
Medical Assistant	72	17	24
X-Ray Technology	44	11	25
Photography	39	19	49
Total Classified	126		
Total Percent	31		
Cluster II			
Accounting	36	10	28
Business Admin.	55	31	56
Secretarial	107	74	69
Data Processing	71	37	52
Total Classified	152		
Total Percent	57		
Cluster III			
Cabinet Making	65	31	48
Carpentry	48	17	35
Building Construction	53	27	51
Total Classified	75		
Total Percent	45		
Cluster IV			
Airframe Mechanic	53	14	26
Airpower Mechanic	50	16	32
Aeronautics	45	28	62
Auto Mechanic	120	56	47
Total Classified	114		
Total Percent	43		

TABLE 22 (Cont.)

Cluster V			
Electronic Technology	117	58	50
Electrical Technology	70	21	30
Business Equipment Tech.	30	13	43
Chemical Technology	33	11	33
Plastics Technology	15	10	67
Total Classified	113		
Total Percent	43		
Cluster VI			
Drafting, Industrial	101	36	36
Drafting, Architectural	63	43	68
Engineering, Civil	50	27	54
Total Classified	106		
Total Percent	50		
Cluster VII			
Criminology	70	36	51
Fire Science	17	8	47
Forestry	21	11	52
Total Classified	55		
Total Percent	51		
Cluster VIII			
Welding	52	6	11
Sheet Metal	46	23	50
Machinist	87	14	16
Auto Body/Fender Repair	60	18	30
Diesel Mechanic	84	38	45
Total Classified	99		
Total Percent	30		
Cluster IX			
Radio/TV Repair	21	20	95
Communications	31	24	77
Total Classified	44		
Total Percent	85		

TABLE 23

Summary of Stepwise Discriminant Analysis of IAS Scores - Within Empirical Clusters (Six Curricula Omitted)

	Step Number	Variable	F-Value	U-Statistic
Cluster I				
	1	Nurturance	26.5	.68
	2	Concrete	18.0	.52
	3	Order	4.5	.48
	4	Influence	2.9	.46
Cluster II				
	1	Concrete	24.1	.79
	2	Influence	17.3	.66
	3	Nurturance	10.2	.59
	4	Aesthetic	6.8	.55
Cluster III				
	1	Influence	6.5	.93
	2	Aesthetic	1.0	.91
	3	Nurturance	.9	.90
	4	Concrete	.4	.90
Cluster IV				
	1	Abstract	6.9	.93
	2	Nurturance	6.2	.87
	3	Influence	4.8	.82
	4	Adventure	2.4	.80
Cluster V				
	1	Influence	9.8	.87
	2	Concrete	8.4	.77
	3	Nurturance	5.2	.71
	4	Abstract	4.0	.67
Cluster VI				
	1	Aesthetic	17.1	.86
	2	Adventure	3.4	.83
	3	Written Expression	3.1	.81
	4	Concrete	2.7	.79

TABLE 23 (Cont.)

Cluster VII				
	1	Influence	6.0	.90
	2	Concrete	3.7	.84
	3	Written Expression	2.2	.80
	4	Nurturance	3.0	.76
Cluster VIII				
	1	Concrete	4.5	.95
	2	Aesthetic	4.4	.90
	3	Order	2.1	.88
	4	Influence	2.9	.84
Cluster IX				
	1	Concrete	18.1	.73
	2	Written Expression	11.5	.60
	3	Order	3.6	.55
	4	Influence	.7	.55

other hand one cannot conclude that a significant F-ratio would necessarily mean that the factor structure is different (Meredith, 1964). However, one would expect such to be the case. Usually the investigator hopes that for this hypothesis the F-ratio is not significant. Theoretically, one should not continue with the test for H_2 if the test for H_1 is significant. In practice, however, the results of the test for H_1 tend to be ignored because the analysis of variance is a robust procedure. The practice of proceeding with H_2 despite the outcome for H_1 will be followed in this report.

H_2, an extension of simple one-way analysis of variance, is a test of the hypothesis of equality of profiles (or vectors) of mean scores for criterion groups. A significant F-ratio would indicate that the array of means for the criterion groups are indeed different.

Findings from the MANOV of the mean IAS profiles within and among the Tryon clusters are shown in Tables 24 and 25. Since the Tryon clustering is based on internal criteria, the differences among the profiles of means for the respective clusters should be exaggerated; those among the curriculum groups within a particular cluster should be greatly reduced.

Despite the fact that the Tryon clusters were based on similarity of mean IAS scores, there were significant variations in mean profiles within all clusters except Number II, policemen and firemen. Thus, as evidenced by both stepwise multiple discriminant analysis and by the H_1-H_2 procedures, the Tryon clustering routine collapsed the 43 curricula into only gross criterion groups at best.

Of most interest perhaps is the number of significant or near significant F-ratios for H_1. Except for Cluster II, all the F-ratios in Table 24 were significant at the .05 level. The test for H_1 (F 3.41) among the five clusters (see Table 25) was significant beyond the .01 level. The large number of degrees of freedom derived from the large N's and the several variables result in rather small F-ratio being statistically significant, when they might ordinarily be disregarded. But the consistency of the significance from cluster to cluster, and especially among the clusters, would seem to indicate that the possibility of differences in factor structure underlying the interest scores of these curriculum groups must be seriously entertained. In other words the IAS items may provide differing stimuli for subjects in the several curricula.

One explanation for the possible differences in factor structure is that the significant F-ratios observed for H_1 resulted from combining the sexes for these analyses. Studies with the Strong Vocational Interest Blank have consistently shown sex differences in factor structure (see Strong, 1943). Yet, previous evidence with IAS has not indicated such sex differences (Stewart and Ronning, 1964). Furthermore, the significant differences in the current analysis appear also for clusters which contain predominately males. Therefore, it seems that

TABLE 24

Summary of Multivariate Analyses of Variance of IAS Scores Within Tryon Clusters Based on Interest Scores

	IAS Means							
	Adv	Ord	Infl	Nurt	Concrete	Writ Exp	Abtr	Aes
Cluster I								
Dental Assistant	47.2	41.4	44.2	59.2	42.4	37.2	42.6	50.0
Secretary	47.5	42.8	47.7	53.9	41.7	37.7	38.3	49.1
Dental Hygienist	46.7	39.3	47.9	61.5	47.6	34.7	50.0	55.9
Fashion Arts	46.9	41.4	43.3	50.2	42.7	38.0	45.2	64.5
Food Preparation	49.0	42.4	46.3	51.9	44.7	36.6	41.7	51.5
Nursing (Reg.)	46.3	33.4	42.5	61.8	41.6	35.6	47.9	50.9
Medical Assist.	47.4	41.7	41.2	65.5	41.4	39.9	44.4	53.9
Cosmetology	50.1	40.9	46.0	52.9	44.1	36.0	42.1	55.5
Dry Cleaning	49.7	45.2	46.5	52.2	50.2	35.3	45.0	49.4
X-Ray Tech.	50.8	41.3	44.2	57.6	53.2	37.1	48.1	52.2
Nursing (Voc.)	48.1	43.2	42.6	68.2	44.3	43.2	44.3	51.2
	Test for H_1:		F 1.20	df	360, ∞	P < .01		
	Test for H_2:		F 7.15	df	80, ∞	P < .01		
Cluster II								
Policeman	60.0	37.2	48.0	49.8	50.5	32.3	42.3	35.7
Fireman	59.8	31.9	39.5	46.9	49.5	24.9	35.9	31.6
	Test for H_1:		F 1.05	df	36, ∞	P > .05		
	Test for H_2:		F 1.00	df	8, ∞	P > .05		
Cluster III								
Air Conditioning	55.5	41.8	46.6	46.9	58.9	34.4	51.1	44.4
Building Constr.	56.7	41.9	48.5	46.1	57.4	37.0	50.6	52.7
Carpentry	56.4	39.6	44.9	46.1	57.8	34.5	47.4	47.6
Welding	54.2	38.2	42.5	43.8	56.4	32.4	45.8	44.1
Drafting, Arch.	54.2	40.1	42.8	44.9	57.4	34.7	52.0	56.0
Printing & Publish.	55.8	39.7	43.9	43.7	57.1	33.2	44.1	47.3
Sheet Metal	57.2	35.9	46.6	43.0	57.3	29.8	47.3	47.0
Radio-TV Repair	50.4	42.2	45.9	43.4	60.6	31.1	48.9	37.6
Dental Tech.	56.4	40.0	45.7	50.5	57.7	37.6	48.6	57.0
Accounting	51.6	51.9	52.6	48.5	50.6	32.4	45.9	35.9
Electronics Tech.	54.2	39.0	41.1	41.6	64.0	31.0	54.4	40.4
	Test for H_1:		F 1.25	df	360, ∞	P < .01		
	Test for H_2:		F 5.21	df	80, ∞	P < .01		

TABLE 24 (Cont.)

Cluster IV								
Bus. Adm.	50.5	46.7	60.9	49.7	51.7	40.8	49.5	42.6
Communications	50.4	33.7	44.7	42.4	46.7	44.5	49.4	49.2
Plastics Tech.	46.1	42.7	49.7	43.1	53.3	37.2	53.3	45.4
Data Processing	49.3	45.5	48.1	48.3	54.5	35.4	51.4	45.7
Photography	51.2	34.7	43.5	45.3	51.9	39.3	52.5	57.2
Chemical Tech.	50.5	40.3	39.1	47.2	58.5	34.4	53.0	41.0
Bus. Equip. Tech.	52.0	43.0	53.2	50.7	60.9	41.3	53.1	42.7

Test for H_1: F 1.25 df 216, ∞ $P < .01$

Test for H_2: F 5.20 df 48, ∞ $P < .01$

Cluster V								
Machinist	58.3	38.9	45.2	44.2	60.5	30.5	48.3	42.4
Aircraft Mech. Pow.	57.0	35.2	42.5	41.7	58.7	30.6	48.0	37.6
Auto Body	57.7	39.8	43.1	44.8	56.1	31.8	46.4	44.5
Engineer, Civil	59.2	37.3	43.0	41.3	61.0	28.8	52.0	41.0
Diesel	60.4	40.2	43.0	44.3	62.0	28.9	46.7	40.0
Draft, Industrial	55.1	35.7	42.3	42.7	60.6	28.2	49.1	48.3
Aeronautics	61.9	38.0	51.2	40.6	60.9	34.3	53.2	42.0
Electrical Tech.	57.1	40.9	42.6	45.5	60.1	31.4	49.2	43.2
Auto Mechanic	59.8	38.5	43.7	42.8	60.9	28.5	44.2	40.5
Aircraft Mech. (Frame)	55.3	36.0	41.7	39.1	59.8	30.8	47.0	38.8
Forestry	59.6	35.6	38.1	41.4	53.8	31.5	41.0	33.8
Cabinet Making	55.0	36.9	40.7	42.0	54.9	31.5	45.5	50.1

Test for H_1: F 1.18 df 396, ∞ $P < .05$

Test for H_2: F 3.45 df 88, ∞ $P < .01$

TABLE 25

Multivariate Analysis of Variance of IAS Scores Among Tryon Clusters

IA[illegible]ale	Cluster				
	I	II	III	IV	V
Adventure	48.2	59.9	55.0	50.2	57.9
Order	41.3	36.2	40.5	41.8	38.0
Influence	44.7	46.4	44.9	49.2	43.2
Nurturance	57.4	49.3	44.9	47.3	42.8
Concrete	44.0	50.3	58.5	53.8	59.6
Written Exp.	37.7	30.8	33.4	38.7	30.2
Abstract	43.6	41.0	49.6	51.4	47.5
Aesthetic	53.2	34.9	46.4	46.2	42.6

Test of H_1: F 3.41 df 144, ∞ $P < .01$
Test of H_2: F 67.42 df 32, ∞ $P < .01$

the observed differences must be accounted for by factors other than sex--factors not yet identified.

A Priori Criterion Groups

The MANOV procedures used with the Tryon clusters were repeated with the *a priori* curriculum groups. Both within and across clusters comparisons were made. Perhaps, since clusters were derived from external criteria, analysis based on these *a priori* groups is more defensible than those based on comparison groups formed from internal criteria. The results of the analysis are shown in Tables 26 and 27.

The *a priori* clusters differed on vectors of mean scores (Table 25). Also the test for H_1 was significant well beyond the .01 level. Within-cluster comparisons yield only two significant F-ratios for H_1--Cluster V which contains technicians and Cluster VI which includes business and office type occupations.

Empirical Criterion Groups

Although the data are somewhat repetitive, the multivariate analysis of variance of the empirical clusters was performed to provide an opportunity to observe relationships among the curricula arranged somewhat differently from that in either the Tryon or *a priori* clusters. Findings are presented in Tables 28 and 29.

Note that for five of the clusters the tests for H_1 were significant at the .05 level or better, again indicating possible differences in factor structure underlying the IAS scores of the occupational groups included in each cluster. As was true with previous analyses, the differences in profiles of means were highly significant for all within-cluster comparisons.

Because of the large numbers of subject variables and criterion groups used in this study, the degrees of freedom are increased to the point where practically any observed difference was statistically significant. Thus, since the F-ratios from the within-group comparisons are rather small, one might dismiss them as resulting from rounding errors. Still the relatively large size of the F-ratio obtained for the across-cluster comparisons, along with similar results from all three clusters in four procedures, are more difficult to dismiss.

Significance levels of differences in profiles of means between various curricula, or between any two clusters, were not determined. However, the nature of the differences can be observed in the relevant tables.

TABLE 26

Vectors of Multivariate Analyses of Variance of Mean IAS Scores for Curricula Within *A Priori* Clusters

	Adv	Ord	Infl	Nurt	Concrete	Writ Exp	Abtr	Aes
Cluster I								
Forestry	60.0	35.6	38.0	41.5	53.9	32.0	41.1	33.7
Criminology	60.0	37.2	48.0	49.8	50.5	32.3	42.3	35.7
Fire Science	59.8	31.9	39.5	46.9	49.5	24.9	35.9	31.6
	Test for H_1:		F 1.23	df	72, ∞	$P > .05$		
	Test for H_2:		F 2.11	df	16,194	$P < .05$		
Cluster II								
Cosmetology	50.1	40.9	46.0	52.9	44.1	36.0	42.1	55.5
Dry Cleaning	49.7	45.2	46.5	52.2	50.2	35.3	45.0	49.4
Fashion Arts	46.9	41.4	43.3	50.2	42.7	38.0	46.2	64.5
Food Prep/Service	49.0	42.4	46.3	51.9	44.7	36.6	41.7	51.5
	Test for H_1:		F 1.17	df	108, ∞	$P > .05$		
	Test for H_2:		F 2.68	df	24, ∞	$P < .01$		
Cluster III								
Dental Assist.	47.2	41.4	44.2	59.2	42.4	37.2	42.6	50.0
Dental Technology	56.4	40.0	45.7	50.5	57.7	37.6	48.6	57.0
Medical Assistant	47.4	41.7	41.2	65.5	41.4	39.9	44.4	53.9
Nursing, Registered	46.3	33.4	42.5	61.8	41.6	35.6	47.9	50.9
Nursing, Vocational	48.1	43.2	42.6	68.2	44.3	43.2	44.3	51.2
X-Ray Technology	50.8	41.3	44.2	57.6	53.2	37.1	48.1	52.2
Dental Hygienist	46.7	39.3	47.9	61.5	47.6	34.7	50.0	55.9
	Test for H_1:		F 1.13	df	216, ∞	$P > .05$		
	Test for H_2:		F 6.37	df	48, ∞	$P < .01$		
Cluster IV								
Air Conditioning	55.5	41.8	46.6	46.9	58.9	34.4	51.1	44.4
Airpower Mechanic	57.0	35.2	42.5	41.7	58.7	30.6	48.0	37.6
Air Frame Mechanic	55.3	36.0	41.7	39.1	59.8	30.8	47.0	38.8
Auto Mechanic	59.8	38.5	43.7	42.8	60.9	28.5	44.2	40.5
Auto Body/Fender	57.7	39.8	43.1	44.8	56.1	31.8	46.4	44.5
Diesel	60.4	40.2	43.0	44.3	62.0	28.9	46.7	40.0
Machinist	58.3	38.9	45.2	44.2	60.5	30.5	48.3	42.4
Sheet Metal	57.2	35.9	46.6	43.0	57.3	29.8	47.3	47.0
Welding	54.2	38.2	42.5	43.8	56.4	32.4	45.8	44.1
	Test for H_1:		F 1.15	df	288, ∞	$P > .05$		
	Test for H_2:		F 2.19	df	64, ∞	$P < .05$		

TABLE 26 (Cont.)

Cluster V								
Aeronautics	61.9	38.0	51.2	40.6	60.9	34.3	53.2	42.0
Bus. Equip. Tech.	53.0	43.0	53.2	50.7	60.9	41.3	53.1	42.7
Chemical Technology	50.5	40.3	39.1	47.2	58.5	34.4	53.0	41.0
Drafting, Arch.	54.2	40.1	42.8	44.9	57.4	34.7	52.0	56.0
Drafting, Indus.	55.1	35.7	42.3	42.7	60.6	28.2	49.1	48.3
Electrical Tech.	57.1	40.9	42.6	45.5	60.1	31.4	49.2	43.2
Electronics Tech.	54.2	39.0	41.1	41.6	64.0	31.0	54.4	40.4
Engineering, Civil	59.2	37.3	43.0	41.3	61.0	28.8	52.0	41.0
Photography	51.2	34.7	43.5	45.3	51.9	39.3	52.5	57.3
Plastics Tech.	46.1	42.7	49.7	43.1	53.3	37.2	53.3	45.4
Radio-TV Repair	50.4	42.2	45.9	43.4	60.6	31.1	48.9	37.6

Test for H_1: F 1.18 df 360, ∞ $P < .05$
Test for H_2: F 5.05 df 80, ∞ $P < .01$

Cluster VI								
Accounting/ Bookkeeping	51.6	51.9	52.6	48.5	50.6	32.4	45.9	35.9
Communications	50.4	33.7	44.7	42.4	46.7	44.5	49.4	49.2
Data Processing	49.3	45.5	48.1	48.3	54.5	35.4	51.4	45.7
Printing/Publish.	55.8	39.7	43.9	43.7	57.1	33.2	44.1	47.3
Secretarial	47.5	42.8	47.7	53.9	41.7	37.7	38.3	49.1
Bus. Adminis.	50.5	46.7	60.9	49.7	51.7	40.8	49.5	42.6

Test for H_1: F 1.48 df 180, ∞ $P < .01$
Test for H_2: F 10.22 df 40, ∞ $P < .01$

Cluster VII								
Building Constr.	56.7	41.9	48.5	46.1	57.4	37.0	50.6	52.7
Cabinet Making	55.0	36.9	40.7	42.0	54.9	31.5	45.5	50.1
Carpentry	56.4	39.6	44.9	46.1	57.8	34.5	47.4	47.6

Test for H_1: F 1.21 df 72, ∞ $P > .05$
Test for H_2: F 1.22 df 16,312 $P > .05$

TABLE 27

Multivariate Analysis of Variance of IAS Scores Among A Priori Clusters

IAS Scale	Cluster						
	I	II	III	IV	V	VI	VII
Adventure	60.0	49.0	48.8	57.7	54.8	50.2	55.9
Order	36.1	41.7	40.3	38.6	38.8	43.6	39.3
Influence	44.8	45.4	43.5	43.9	43.7	49.5	44.4
Nurturance	47.8	51.9	61.4	43.6	43.6	49.0	44.5
Concrete	51.0	44.5	46.0	59.4	60.1	49.5	56.6
Written Exp.	31.0	36.6	38.5	30.6	32.5	37.1	34.1
Abstract	41.0	43.3	46.0	47.0	51.8	45.3	47.7
Aesthetic	34.7	56.3	52.7	41.9	45.3	45.8	50.2

Test of H_1: F 2.94 df 216, ∞ P $<.01$
Test of H_2: F 46.96 df 48, ∞ P $<.01$

TABLE 28

Multivariate Analysis of Variance IAS Scores Within Empirical Clusters (Six Curricula Removed)

	Adv	Ord	Infl	Nurt	Conc	Writ Exp	Abst	Aes
Cluster I								
Dental Assistant	47.2	41.4	44.2	59.2	42.4	37.2	42.6	49.9
Dental Hygienist	46.7	39.3	47.9	61.5	47.6	34.7	50.0	55.9
Dental Technician	56.4	40.0	45.7	50.5	57.7	37.6	48.6	57.0
Registered Nurse	46.3	33.4	42.5	61.8	41.6	35.6	47.9	50.9
Vocational Nurse	48.1	43.2	42.6	68.2	44.3	43.2	44.3	51.2
Medical Assistant	47.4	41.7	41.2	65.5	41.4	39.9	44.4	53.9
X-Ray Technician	50.8	41.3	44.2	57.6	53.3	37.1	48.1	52.2
Photographer	51.2	34.7	43.5	45.3	51.9	39.3	52.5	57.2

Test for H1: F 1.12 df 252, ∞ $P < .05$

Test for H_2: F 6.90 df 56, ∞ $P < .01$

	Adv	Ord	Infl	Nurt	Conc	Writ Exp	Abst	Aes
Cluster II								
Accountant	51.6	51.9	52.6	48.5	50.6	32.4	45.9	35.9
Business Admin.	50.5	46.7	60.9	49.7	51.7	40.8	49.5	42.6
Secretary	47.5	42.8	47.7	53.9	41.7	37.7	38.3	49.1
Data Processing	49.3	45.5	48.1	48.3	54.5	35.4	51.4	45.7

Test for H_1: F 1.62 df 108, ∞ $P < .01$

Test for H_2: F 10.13 df 24, ∞ $P < .01$

	Adv	Ord	Infl	Nurt	Conc	Writ Exp	Abst	Aes
Cluster III								
Cabinet Making	55.0	36.9	40.7	42.0	54.9	31.5	45.5	50.1
Carpentry	56.4	39.6	44.9	46.1	57.8	34.5	47.4	47.6
Bldg. Const.	56.7	41.9	48.5	46.1	57.4	37.0	50.6	52.7

Test for H_1: F 1.21 df 72, ∞ $P > .05$

Test for H_2: F 1.22 df 16,312 $P > .05$

	Adv	Ord	Infl	Nurt	Conc	Writ Exp	Abst	Aes
Cluster IV								
Airframe Mechanic	55.3	36.0	41.7	39.1	59.8	30.8	47.0	38.8
Airpower Mechanic	57.0	35.2	42.5	41.7	58.7	30.6	48.0	37.6
Aeronautics	61.9	38.0	51.2	40.6	60.9	34.3	53.2	42.0
Auto Mechanic	59.8	38.5	43.7	42.8	60.9	28.5	44.2	40.5

Test for H_1: F .95 df 108, ∞ $P > .05$

Test for H_2: F 3.35 df 24, ∞ $P < .01$

TABLE 28 (Cont.)

Cluster V								
Electronic Tech.	54.2	39.0	41.1	41.6	64.0	31.0	54.4	40.4
Electrical Tech.	57.1	40.9	42.6	45.5	60.1	31.4	49.2	43.2
Bus. Equip. Tech.	52.0	43.0	53.2	50.7	60.9	41.3	53.1	42.7
Chemical Tech.	50.5	40.3	39.1	47.2	58.5	34.4	53.0	41.0
Plastics Tech.	46.1	42.7	49.7	43.1	53.3	37.2	53.3	45.4

Test for H_1: F 1.33 df 144, ∞ $P < .01$
Test for H_2: F 4.17 df 32, ∞ $P < .01$

Cluster VI								
Industrial Draft.	55.1	35.7	42.3	42.7	60.6	28.2	49.1	48.3
Architect. Draft.	54.2	40.1	42.8	44.9	57.4	34.7	52.0	56.0
Civil Eng.	59.2	37.3	43.0	41.3	61.0	28.8	52.0	41.0

Test for H_1: F .86 df 72, ∞ $P > .05$
Test for H_2: F 4.25 df 16,408 $P < .01$

Cluster VII								
Policeman	60.0	37.2	48.0	49.8	50.5	32.3	42.3	35.7
Fireman	59.8	31.9	39.5	46.9	49.5	24.9	35.9	31.6
Forestry	59.6	35.6	38.1	41.4	53.8	31.5	41.0	33.8

Test for H_1: F 1.23 df 72, ∞ $P > .05$
Test for H_2: F 2.08 df 16,196 $P < .01$

Cluster VIII								
Welding	54.2	38.2	42.5	43.8	56.4	32.4	45.8	44.1
Sheet Metal	57.2	35.9	46.6	43.0	57.3	29.8	47.3	47.0
Machinist	58.3	38.9	45.2	44.2	60.5	30.5	48.3	42.4
Auto Body/Fender	57.7	39.8	43.1	44.8	56.1	31.8	46.3	44.5
Diesel	60.4	40.3	43.0	44.3	62.0	28.9	46.7	40.0

Test for H_1: F 1.22 df 144, ∞ $P < .05$
Test for H_2: F 2.18 df 32, ∞ $P < .01$

Cluster IX								
Radio-TV Repair	50.4	42.2	45.9	43.4	60.6	31.1	48.9	37.6
Communication	50.4	33.7	44.7	42.4	46.7	44.5	49.4	49.2

Test for H_1: F 1.42 df 36, ∞ $P = .05$
Test for H_2: F 4.78 df 8,43 $P < .01$

TABLE 29

Multivariate Analyses of Variance of IAS Scores Among Empirical Clusters

Cluster	Mean Scores							
	Adv	Ord	Infl	Nurt	Conc	Writ Exp	Abst	Aes
I	49.0	39.8	43.5	59.8	46.6	38.6	46.6	53.1
II	49.2	45.5	51.2	50.8	48.4	37.0	45.0	45.1
III	55.9	39.3	44.4	44.5	56.6	34.1	47.7	50.2
IV	58.7	37.3	44.3	41.5	60.3	30.3	47.0	39.9
V	53.8	40.3	43.1	44.4	61.3	33.0	52.6	41.8
VI	55.8	37.4	42.6	43.0	59.7	30.2	50.6	48.9
VII	59.9	36.1	44.8	47.8	51.0	31.0	41.0	34.7
VIII	57.9	38.9	44.0	44.1	59.0	30.5	47.0	43.1
IX	50.4	37.1	45.2	42.8	52.3	39.1	49.2	44.5

Test for H_1: F 2.53 df 288, ∞
Test for H_2: F 30.71 df 64, ∞

Responses to Questionnaires

Grouped According to Interest Clusters

That the Tryon clusters formed from interest scores also differ on certain attitudes and background factors is apparent from the data in Table 30. Because of the large numbers of subjects involved in the several clusters, no tests of significance were applied to the data. Relatively small differences in percentages would be statistically significant. The responses are presented in percentages which were computed on the basis of the number in each cluster. Due to missing responses to certain items, percentages do not always add up to 100. Some of the more apparent trends are noted below:

--The clusters differed with respect to the number now working. Cluster I, containing a large proportion of the female subjects, had the greatest percentage of unemployed; Cluster II, firemen and policemen, the largest percentage employed. While there was considerable variation within each cluster, the students tended to be employed in jobs related to their curricula. For example, a large percentage (21) of those in Cluster IV, containing students in curricula such as business administration and data processing, were employed in clerical and sales occupations.

--Relatively more of those in Clusters IV and I reported that their high school grades had been in the upper quarter of their class than did those in the other three clusters. More of those in Clusters II (firemen) and V (mechanics), reported that they were in the lower third.

--Relatively more of those in Cluster IV reported that their fathers were employed in technical and managerial occupations.

--Relatively more of those in Cluster II (firemen and policemen) reported that their friends had dropped out of school. A relatively small number of those in Cluster IV had friends who attended junior college to learn a trade. A fairly large proportion of subjects in all clusters except III (carpentry, sheet metal and electronics) reported that their friends entered junior college with plans to transfer to a state college or university. Only 3 percent of Cluster III stated that their friends entered a 4-year college.

--In all clusters more than three out of four students indicated that they were quite sure they will continue in the field for which they were studying. However, if they were free to choose any occupation they desired, almost one out of two from Clusters I and III and one out of three from Clusters IV and V would enter a professional level occupation. Only 13 percent of firemen and policemen would aspire to enter a professional level job.

--With the exception of those in Cluster IV almost half of the students made their choices of occupations in senior high school.

Approximately half of those in Cluster IV (mechanics, etc.) indicated that they had made their decisions after they entered junior college.

--Almost an equal percentage of subjects in each cluster tended to pick jobs in which there is a moderate degree of risk. However, relatively more of those in Cluster I, predominantly women, and Cluster II, firemen and policemen, preferred low-risk jobs--perhaps a finding to be expected especially for firemen and policemen considering the civil service protection afforded them in their intended occupations. More of those in the other three clusters preferred high-risk jobs.

--With respect to source of life satisfactions, occupation, making money, marriage and family life, and to some extent leisure time activities tended to be most frequently checked by subjects in all clusters. Apparently religion, community and world affairs and the arts have very little importance in the life plans of these students. These findings may indicate a need to reexamine the nature of the liberal arts offerings available to occupation-oriented students. There was of course considerable response variation among the clusters. While marriage and family life were rated as most important by about half or more of all the subjects, 67 percent of those in Cluster I rated it as "most important." Again the preponderance of females in Cluster I must be pointed out.

--In general, about the same percentage of subjects in all clusters perceived their chances of success in junior college either for purposes of transferring to a four-year program or for completing a terminal program as "fair" or "very good." There were, however, differences among the clusters with respect to perceived success in a state college or university or in a private institution. Those in Clusters IV (business) and I, indicated more frequently that they had a "fair" or "very good" chance of succeeding in these institutions.

The questionnaire data were not reanalyzed according to the a *priori* and empirical clusters, as such analyses would not have provided additional information commensurate with the effort involved.

TABLE 30

RESPONSES (EXPRESSED AS PERCENTAGES) TO ITEMS ON THE QUESTIONNAIRE

Responses Grouped According to Interest Clusters

Item	IAS Cluster				
	I	II	III	IV	V
1. If you are now employed, what is the title of your job?					
a. unemployed	55	33	46	47	45
b. professional	06	--	04	03	02
c. technical, managerial	11	--	--	06	02
d. clerical and sales	11	15	11	21	11
e. service occupations	07	25	13	10	15
f. farming, fishery, forestry	--	--	--	--	02
g. processing occupations	--	--	--	01	01
h. machines trades occupations	--	--	05	03	09
i. bench work occupations	--	--	03	02	--
j. structural work occupations	--	--	06	--	03
k. miscellaneous occupations	01	20	08	05	10
2. How good, in general, were your high school grades?					
a. top quarter of your class	19	09	10	23	09
b. second quarter of your class	47	41	44	46	43
c. in the third quarter	29	41	35	23	41
d. in the lowest quarter	02	07	06	04	04
3. What is your father's job?					
a. professional	12	09	09	12	07
b. technical, managerial	21	15	16	27	18
c. clerical and sales	11	09	09	07	09
d. service occupations	12	18	09	09	07
e. farming, fishery, forestry	06	07	06	04	08
f. processing occupations	18	--	01	02	02
g. machines trades occupations	08	09	12	06	16
h. bench work occupations	02	01	03	02	02
i. structural work occupations	13	11	17	14	15
j. miscellaneous occupations	08	01	09	09	13

4. What is your mother's job?

a. professional	11	01	06	10	08
b. technical, managerial	05	--	05	07	03
c. clerical and sales	24	24	19	17	19
d. service occupations	08	13	06	09	09
e. farming, fishery, forestry	--	--	--	02	01
f. processing occupations	01	--	01	--	01
g. machines trades occupations	02	--	03	02	02
h. bench work occupations	02	--	03	--	01
i. structural work occupations	--	--	--	--	01
j. miscellaneous	46	52	48	51	52

5. Most of my friends (check one):

a. dropped out of high school	02	34	03	04	02
b. graduated and got a job	23	26	27	22	22
c. entered junior college to learn a trade	17	17	15	08	23
d. entered junior college with plans to transfer to state college or university	31	44	11	37	30
e. entered military service	02	--	10	05	11
f. entered a four-year college	19	--	03	20	06
g. other	04	--	01	03	03

6. HHow far did your father get in school?

a. 00	--	--	01	02	01
b. 01	--	--	--	--	--
c. 02	--	--	01	--	--
d. 03	01	--	01	01	--
e. 04	02	--	01	02	01
f. 05	01	--	01	--	01
g. 06	06	--	03	06	04
h. 07	02	--	01	--	01
i. 08	07	09	10	09	09
j. 09	03	05	04	01	04
k. 10	05	--	05	05	05
l. 11	05	01	06	02	03
m. 12	29	46	30	27	38
n. 13	02	--	02	04	02
o. 14	09	01	05	11	07
p. 15	01	--	01	02	01
q. 16	13	10	12	15	10
r. 17	--	--	--	--	--
s. 18	01	--	01	02	01
t. 19	--	--	--	01	--
u. 20	02	--	01	01	01

7. How far did your mother get in school?

a. 00	--	--	01	--	01
b. 01	--	--	--	--	--
c. 02	--	--	--	--	--
d. 03	01	--	01	02	01
e. 04	--	--	01	--	01
f. 05	01	--	--	--	--
g. 06	03	--	04	04	03
h. 07	01	--	--	01	01
i. 08	07	--	06	05	07
j. 09	02	--	03	03	02
k. 10	06	--	04	04	04
l. 11	04	--	03	02	03
m. 12	40	64	43	43	40
n. 13	05	01	02	02	03
o. 14	10	09	06	12	10
p. 15	01	--	--	03	01
q. 16	09	05	09	14	10
r. 17	01	--	--	--	--
s. 18	01	--	01	02	--
t. 19	--	--	--	--	--
u. 20	--	--	--	--	--

8. How sure are you that you will continue in this field?

a. very sure	62	68	45	43	41
b. quite sure	26	23	33	32	35
c. somewhat unsure	08	01	13	14	--
d. not at all sure	04	--	04	05	07

9. Suppose that in about 15 years you could make good in whatever job you chose. What job would you choose?

a. professional	48	13	45	36	31
b. technical, managerial	19	01	15	38	24
c. clerical and sales	10	--	04	09	01
d. service occupation	15	75	01	01	--
e. farming, fishery, forestry	--	--	01	01	--
f. processing occupations	--	--	--	03	--
g. machines trades occupations	--	--	06	03	22
h. bench work occupations	01	--	03	--	01
i. structural work occupations	--	--	16	01	10
j. miscellaneous occupations	02	--	03	02	02

10. Please tell as near as you can remember when you decided what field of work to enter.					
a. before junior high school	11	10	04	05	07
b. during junior high school	13	14	11	05	10
c. during senior high school	45	54	42	35	47
d. in junior college	27	16	28	45	24
e. I have not yet decided	02	--	05	07	08
f. other	01	--	03	02	01
11. If you had your choice, which of the following kinds of jobs would you pick?					
a. a job which doesn't pay much money but which you were sure of keeping.	41	43	33	22	33
b. a job which pays good money but which you have a 50-50 chance of not being able to hold down.	37	34	34	39	36
c. a job which pays real good money if you can keep it, but one in which chances of failure are high.	20	21	30	33	29
12. If you were back in high school now, what would you do differently?					
a. take a college preparatory program	29	29	35	34	31
b. take a vocational program	09	01	18	09	19
c. take a business program	14	01	10	17	08
d. take a general program	07	15	05	05	08
e. study harder or get help on study problems	53	59	57	55	57
f. learn more about chances for certain jobs	30	22	30	26	28
g. ask help from teachers or counselors with my problems	25	31	29	29	24
h. choose different friends	07	01	07	07	06
i. take more active part in out-of-class activities	36	31	29	34	31
j. take less active part in out-of-class activities	02	--	05	03	03
k. take different subjects in same program	13	01	13	12	11
l. take high school more seriously	40	68	59	51	54
m. would not do anything differently	13	10	10	11	10
n. other	09	13	10	11	08

13. What three activities in your life do you expect to give you the most satisfaction? Please write a "1" next to the most important; "2" next to the second most important; "3" next to the third most important. Place a "0" next to the least important.

a. occupation or job					
"1"	17	33	29	29	32
"2"	40	31	33	31	30
"3"	21	16	14	20	16
"0"	01	--	--	--	01
2 b. making money					
"1"	04	01	11	07	11
"2"	15	18	19	23	22
"3"	14	20	19	19	20
"0"	11	01	04	04	03
c. marriage and family life					
"1"	67	48	44	54	42
"2"	14	29	22	25	24
"3"	07	01	16	09	17
"0"	02	--	03	02	02
d. leisure time play activities; hobbies, outdoor living, sports					
"1"	03	01	07	02	07
"2"	09	01	11	12	13
"3"	22	33	23	24	25
"0"	05	01	05	03	03
e. religious activities					
"1"	05	--	03	03	03
"2"	12	01	05	05	03
"3"	12	01	09	09	06
"0"	10	01	09	13	10
f. taking part in affairs of your community					
"1"	--	--	--	01	--
"2"	02	--	01	02	01
"3"	05	01	04	05	03
"0"	08	--	08	05	08

g. taking part in activities directed toward making world conditions better					
"1"	01	--	01	02	01
"2"	02	--	02	03	01
"3"	04	--	04	04	03
"0"	12	01	07	10	11
h. literature, art, or music					
"1"	01	--	01	02	01
"2"	03	--	01	04	01
"3"	08	--	04	06	02
"0"	15	30	21	11	26
i. other					
"1"	01	--	02	01	01
"2"	--	--	01	--	01
"3"	02	--	01	02	01
"0"	01	--	01	03	01

14. Before each of the following vocations put the number that tells what you as a high school senior, thought were your chances of success in that vocation.

a. skilled craftsman (carpenter, painter, mechanic, etc.)					
1. no chance	51	01	07	26	04
2. slight chance	14	25	09	14	05
3. fair chance	16	43	31	30	30
4. very good chance	09	21	47	24	54
b. managerial (business position, etc.)					
1. no chance	12	01	18	08	18
2. slight chance	25	39	33	24	35
3. fair chance	31	38	31	41	35
4. very good chance	18	01	08	23	04
c. unskilled laborer					
1. no chance	48	32	29	40	32
2. slight chance	14	16	17	13	13
3. fair chance	11	13	14	09	12
4. very good chance	17	31	29	29	33
d. high-level professional (doctor, lawyer, etc.)					
1. no chance	33	36	43	30	47
2. slight chance	27	33	30	32	32
3. fair chance	22	21	12	19	09
4. very good chance	11	01	07	13	04

e. service (domestic, railroad porter, etc.)					
1. no chance	39	27	28	39	28
2. slight chance	20	24	29	23	27
3. fair chance	15	23	19	17	20
4. very good chance	15	18	12	14	14
f. athlete (ball player, etc.)					
1. no chance	55	23	36	52	30
2. slight chance	23	29	25	23	28
3. fair chance	10	33	18	13	24
4. very good chance	04	15	11	05	11
g. semiskilled worker (assembly-line worker, etc.)					
1. no chance	26	13	07	17	07
2. slight chance	24	31	21	22	24
3. fair chance	26	29	38	32	32
4. very good chance	15	22	23	21	28
h. white-collar worker (sales clerk, etc.)					
1. no chance	07	01	14	07	16
2. slight chance	10	21	23	15	25
3. fair chance	38	45	37	34	36
4. very good chance	36	23	17	34	14

15. As a high school senior, what did you think your chances of success were in the following types of schools?

a. junior college with idea of changing later to 4-year college or university					
1. no chance	09	01	07	06	07
2. slight chance	15	18	16	12	19
3. fair chance	35	40	39	33	41
4. very good chance	35	32	30	45	28
b. junior college (job program)					
1. no chance	03	--	04	08	02
2. slight chance	04	01	08	08	07
3. fair chance	24	33	27	27	30
4. very good chance	63	54	52	50	55
c. state college					
1. no chance	14	01	13	11	16
2. slight chance	25	45	30	21	34
3. fair chance	33	33	35	41	33
4. very good chance	19	01	13	21	09

d. University of California					
1. no chance	41	45	42	38	49
2. slight chance	31	36	31	30	31
3. fair chance	14	01	12	17	09
4. very good chance	08	--	04	09	03
e. private college or university					
1. no chance	41	60	50	37	54
2. slight chance	21	26	26	29	23
3. fair chance	20	01	11	17	10
4. very good chance	10	--	03	10	04

FINDINGS--OMNIBUS PERSONALITY INVENTORY

Stepwise Discriminant Analyses

Tryon Clusters

As with the IAS data, a Tryon cluster analysis of the curriculum groups based on OPI scores was performed in order to reduce the number of criterion groups.

Again the attention of the reader is drawn to the limitations discussed in the previous sections on groupings derived from internal criteria. The curricula included in each OPI cluster are shown in Table 31. Six criterion groups were formed instead of five as for the IAS. While there was a considerable amount of overlap with respect to the curriculum groups included, it is apparent that clusters based on OPI scores were quite different from those based on IAS data. Some of the most striking differences can be summarized as follows:

> --Curricula containing mostly female subjects were more evenly dispersed among the clusters based on OPI scores.
> --Policemen and firemen were grouped in separate clusters--firemen belonging with forestry and radio-and-TV repair while policemen were classified along with machinists, electronics technicians and the like.
> --Students with a medical orientation--medical assistants and vocational and registered nurses--were grouped together. Dental assistants were grouped in Cluster II along with those preparing for dry cleaning, secretarial work and food preparation. Dental technicians and hygienists fell into Cluster V along with those preparing for data processing, X-ray technicians, cosmetology, and business equipment technology.

Profiles of the mean OPI scores for curricula included in each of the OPI clusters are shown in Figures 9 through 14. Plots for the cluster means are shown in Figure 15. In general, the overlap among the means is so great that plots cannot be distinguished from each other.

That the obtained curricula included in the OPI clusters were not homogeneous with respect to OPI scores is apparent in Tables 31 and 32. There was significant discrimination within all clusters. Also it is of interest to note the differences in the ability of the OPI scales to differentiate among the curriculum groups included in each of the clusters. The three scales which most clearly differentiated among those in Cluster I were Impulse Expression, Thinking Introversion and Estheticism; in Cluster II were Theoretical Orientation, Estheticism and Social Introversion; in Cluster III were Theoretical Orientation, Autonomy and Thinking Introversion; in Cluster IV were Autonomy and Social Introversion; in Cluster V

TABLE 31

Summary of Within Cluster Stepwise Multiple Discriminant Analyses of OPI Scores - Subjects Correctly Classified (Clusters Formed by Tryon's Clustering Procedure)

	Total Number		No. of Cases Classified	Percent of Cases Classified
Cluster I				
Fireman	17		8	47
Forestry	21		8	38
Radio & TV Repair	21		16	76
Total Classified		32		
Total Percent Classified		54		
Cluster II				
Dry Cleaning	24		6	25
Food Preparation	57		21	37
Accounting/Bookkeeping	36		16	44
Dental Assisting	60		16	27
Secretarial/Stenography	107		33	31
Total Classified		92		
Total Percent Classified		32		
Cluster III				
Machinist	87		0	00
Drafting, Industrial	101		17	17
Criminology	70		19	24
Carpentry	48		7	15
Aircraft Mechanic, Power	50		1	02
Engineering, Civil	50		1	02
Welding	52		0	00
Air Conditioning	75		3	04
Electrical Technology	70		4	06
Cabinet Making	65		0	00
Printing & Publishing	51		7	14
Building Construction	53		18	34
Auto Mechanic	120		12	10
Electronic Technology	117		13	11
Chemical Technology	33		9	27
Diesel	84		0	00
Sheet Metal	46		0	00
Aircraft Mechanic	53		3	06

TABLE 31 (Cont.)

Cluster III (Cont.)				
Auto Body	60		10	17
Drafting, Architectural	63		7	11
Total Classified		131		
Total Percent Classified		10		
Cluster IV				
Medical Assisting	72		22	31
Nursing, Vocational	69		40	58
Nursing, Professional	51		21	41
Total Classified		83		
Total Percent Classified		43		
Cluster V				
Data Processing	71		21	30
Dental Technology	46		2	04
Business Administration	55		9	16
Cosmetology	108		46	43
X-Ray Technology	44		2	05
Fashion Arts	65		28	43
Dental Hygienist	27		12	44
Business Equip. Tech.	30		5	17
Aeronautics	45		14	31
Total Classified		139		
Total Percent Classified		28		
Cluster VI				
Plastics Technology	15		10	67
Photography	39		17	44
Communications	31		18	58
Total Classified		45		
Total Percent Classified		53		

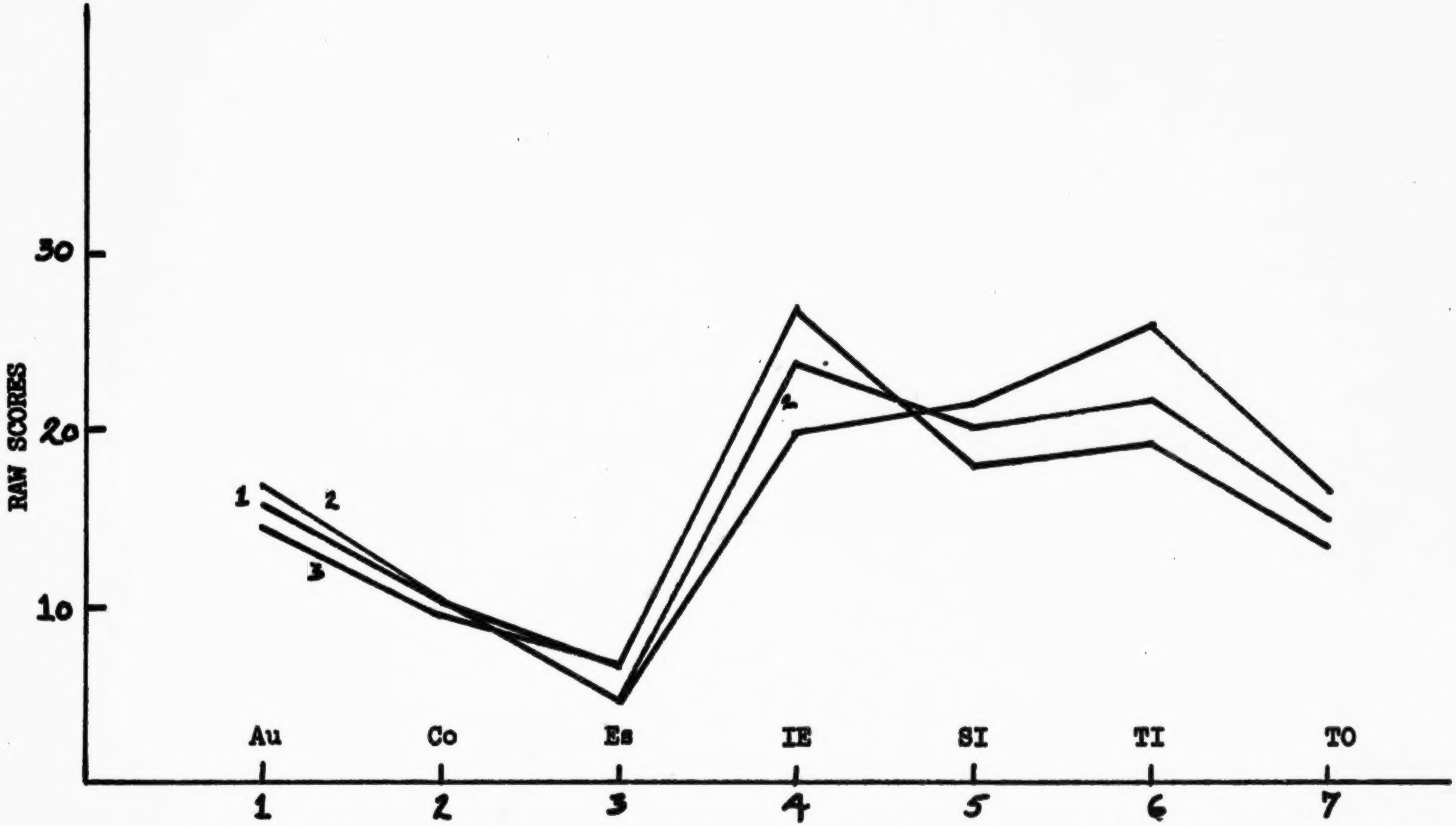

Fig. 9 Plots of mean OPI raw scores for curricula within Tryon Cluster I
(Numbers refer to order in which curricula
are listed, for each cluster, in Table)

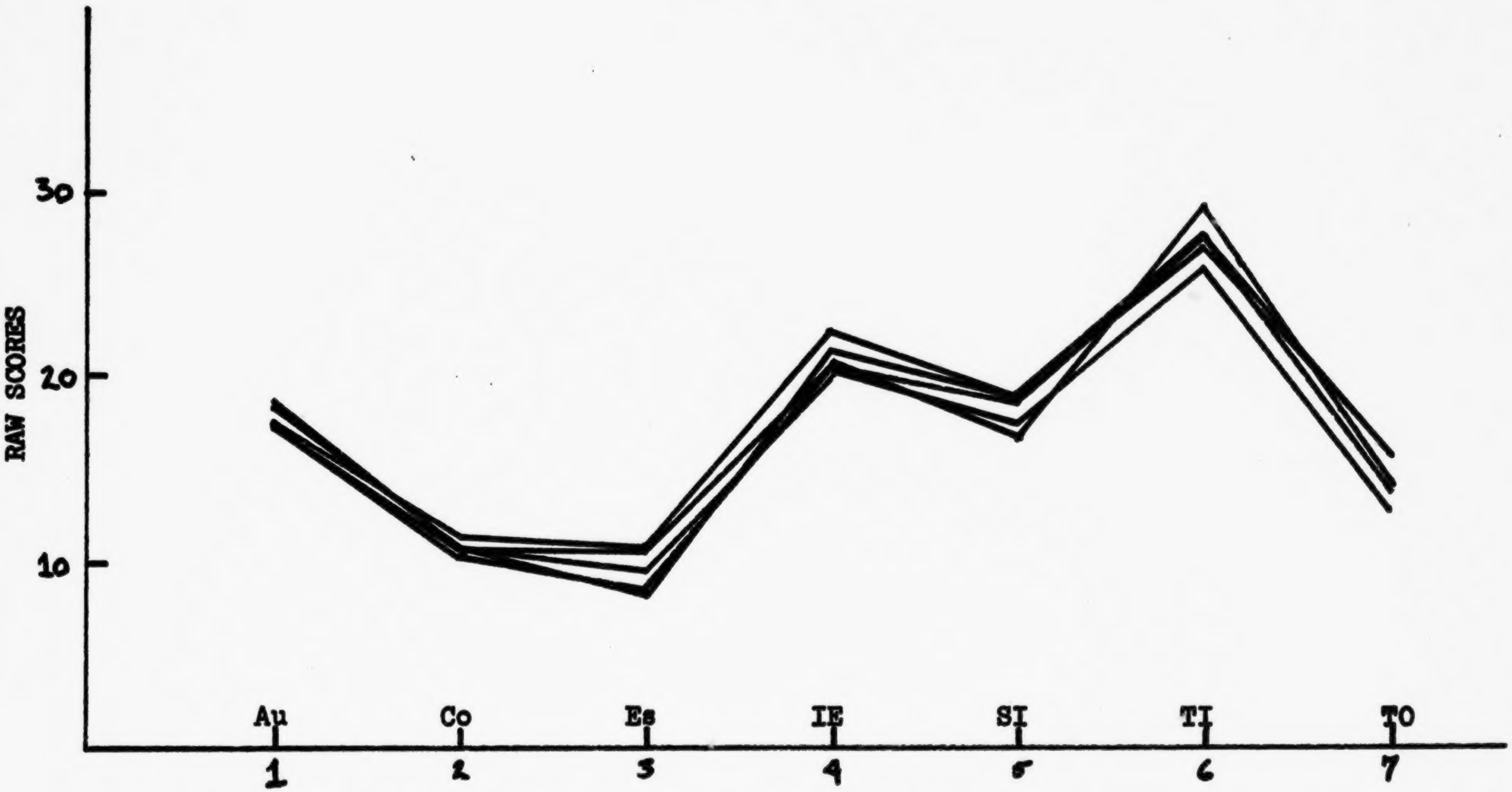

Fig. 10 Plots of mean OPI raw scores for curricula within Tryon Cluster II

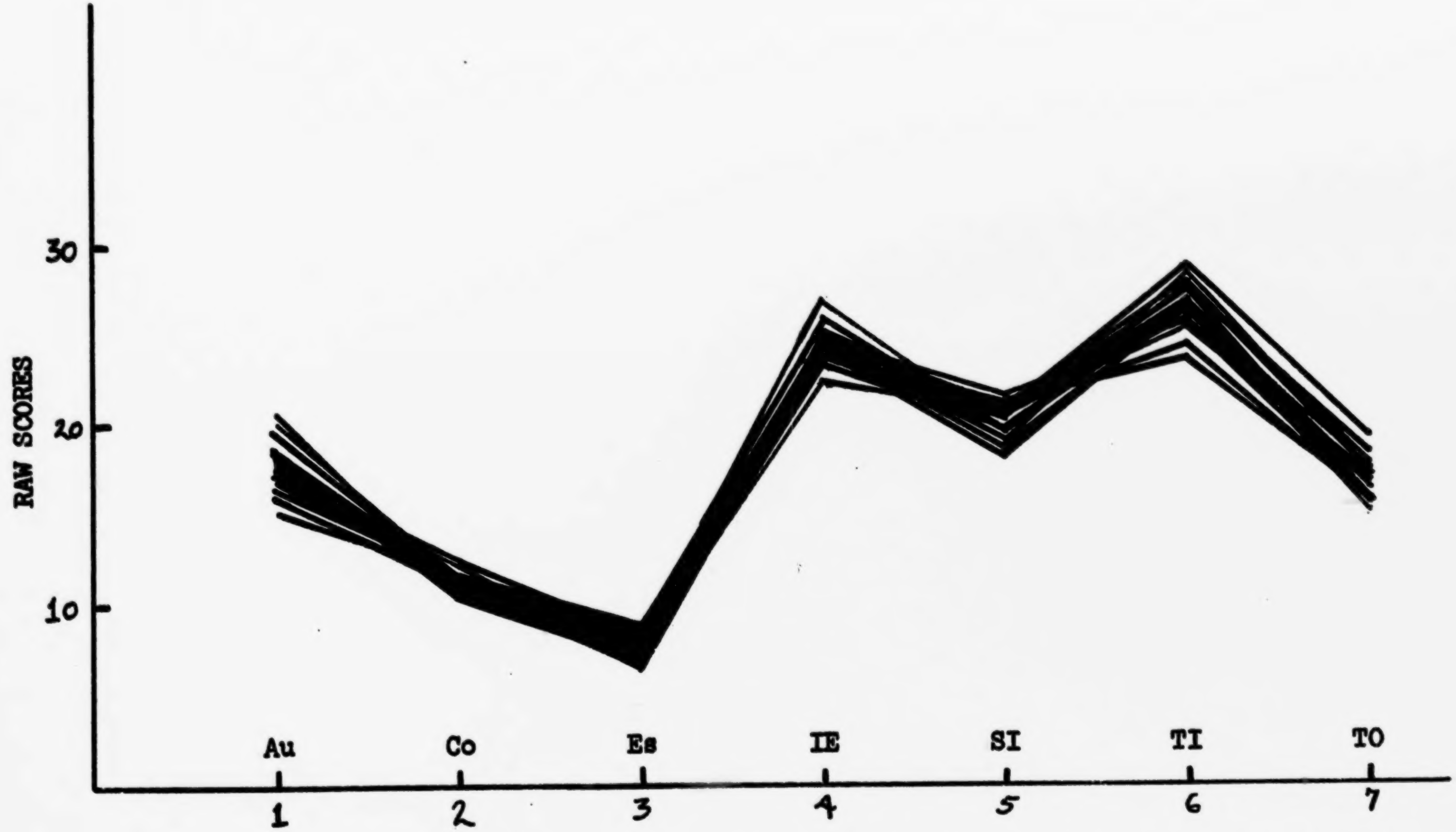

Fig. 11 Plots of mean OPI raw scores for curricula within Tryon Cluster III

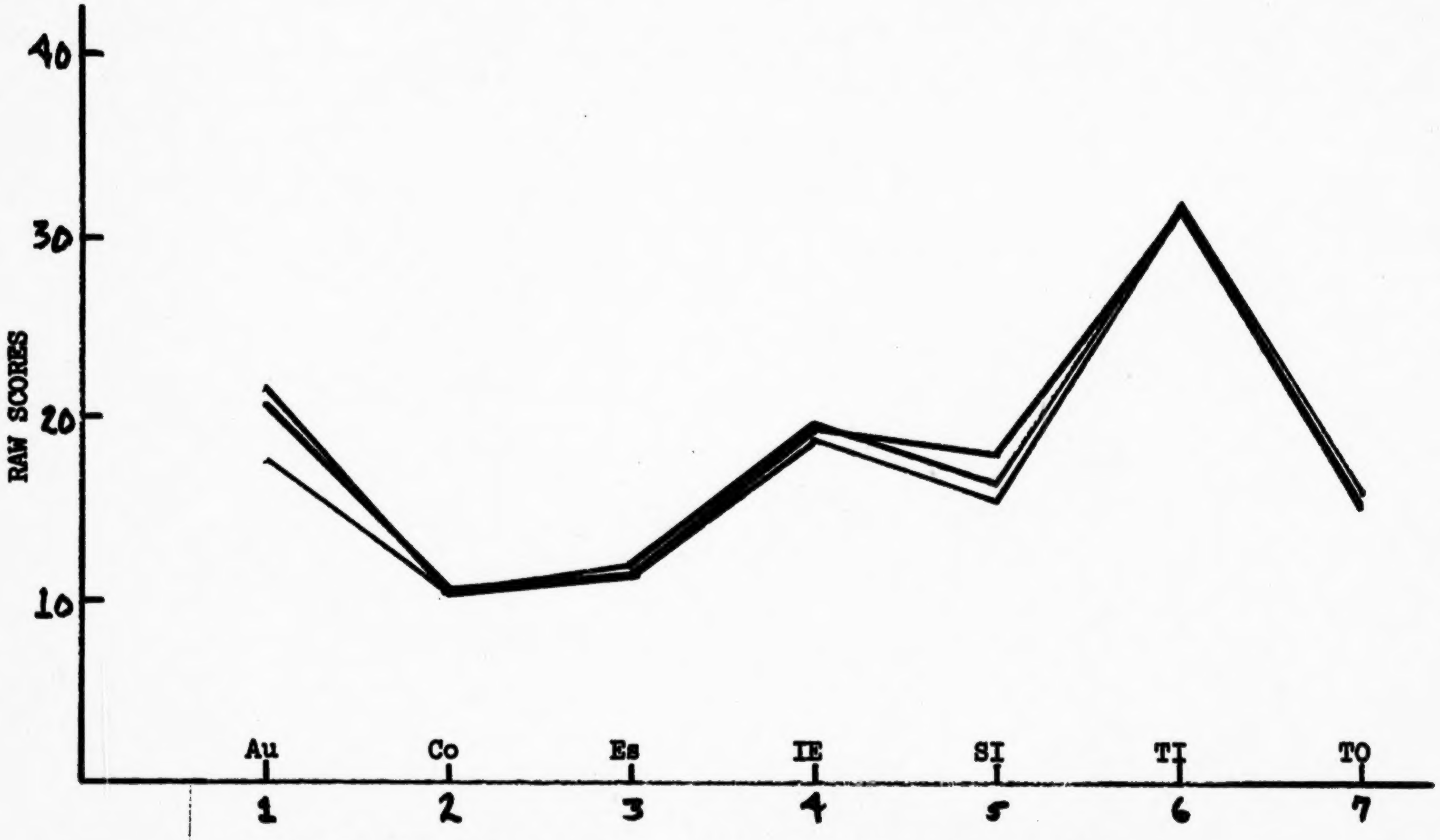

Fig. 12 Plots of mean OPI raw scores for curricula within Tryon Cluster IV

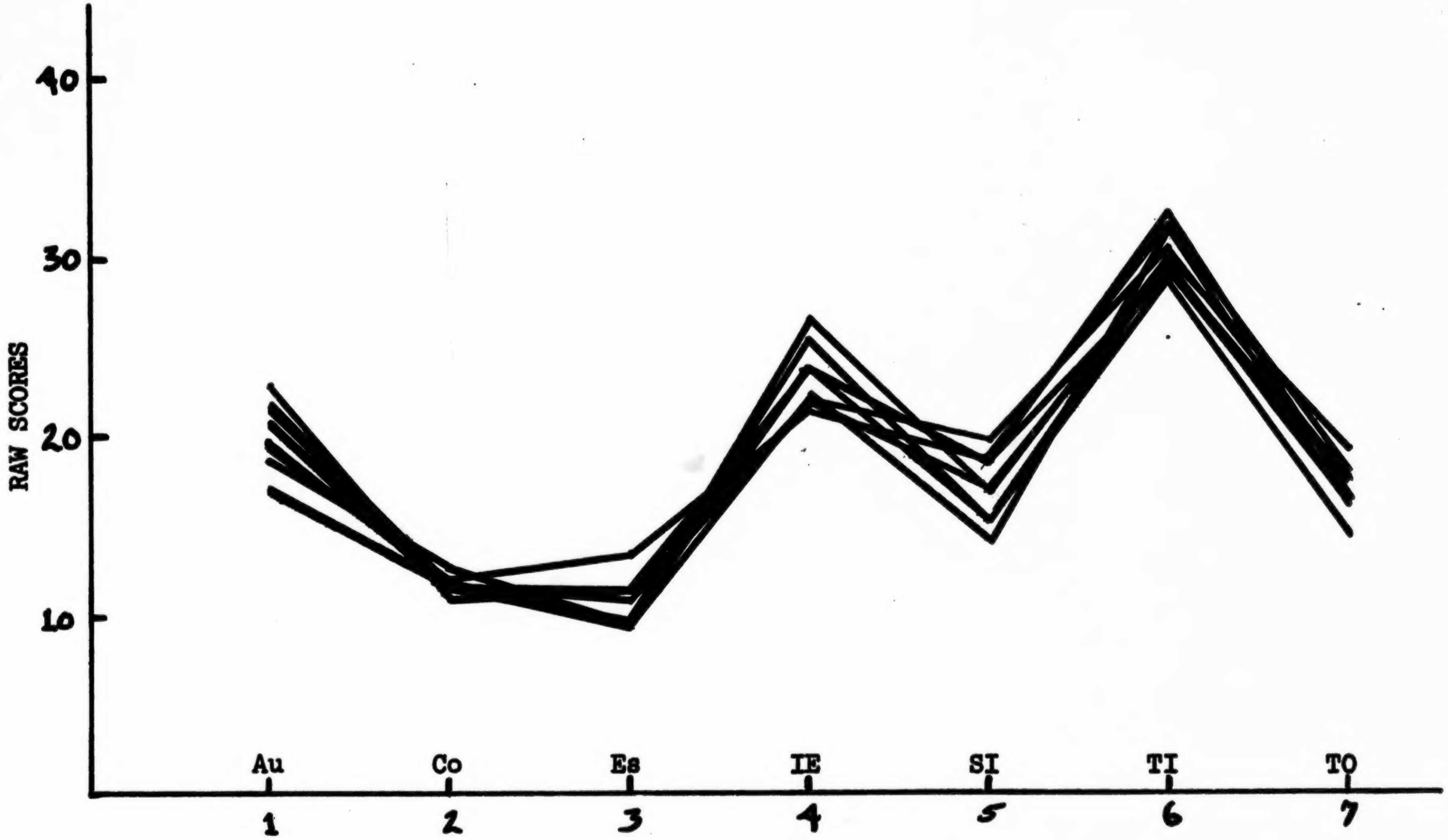

Fig. 13 Plots of mean OPI raw scores for curricula within Tryon Cluster V

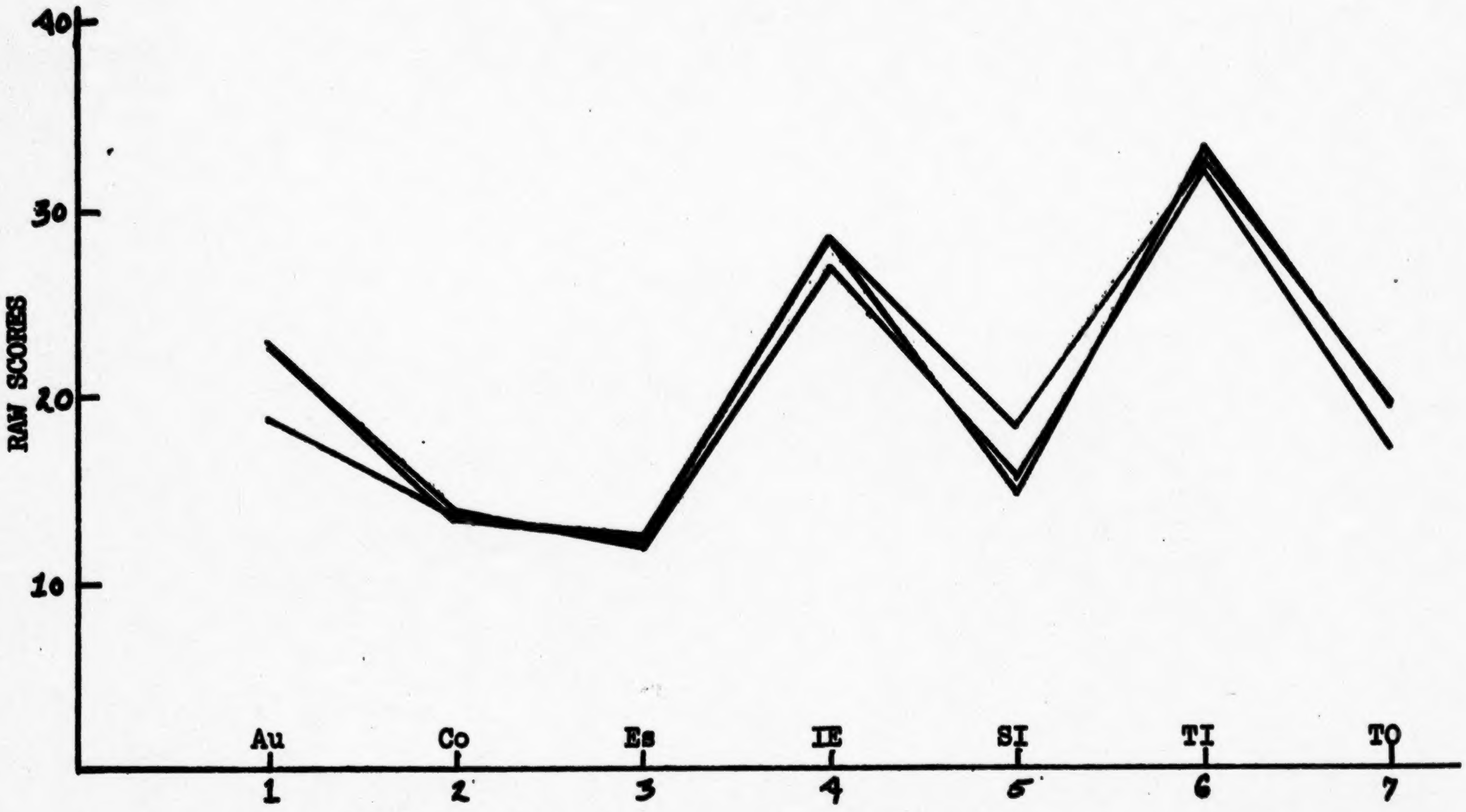

Fig. 14 Plots of mean OPI raw scores for curricula within Tryon Cluster VI

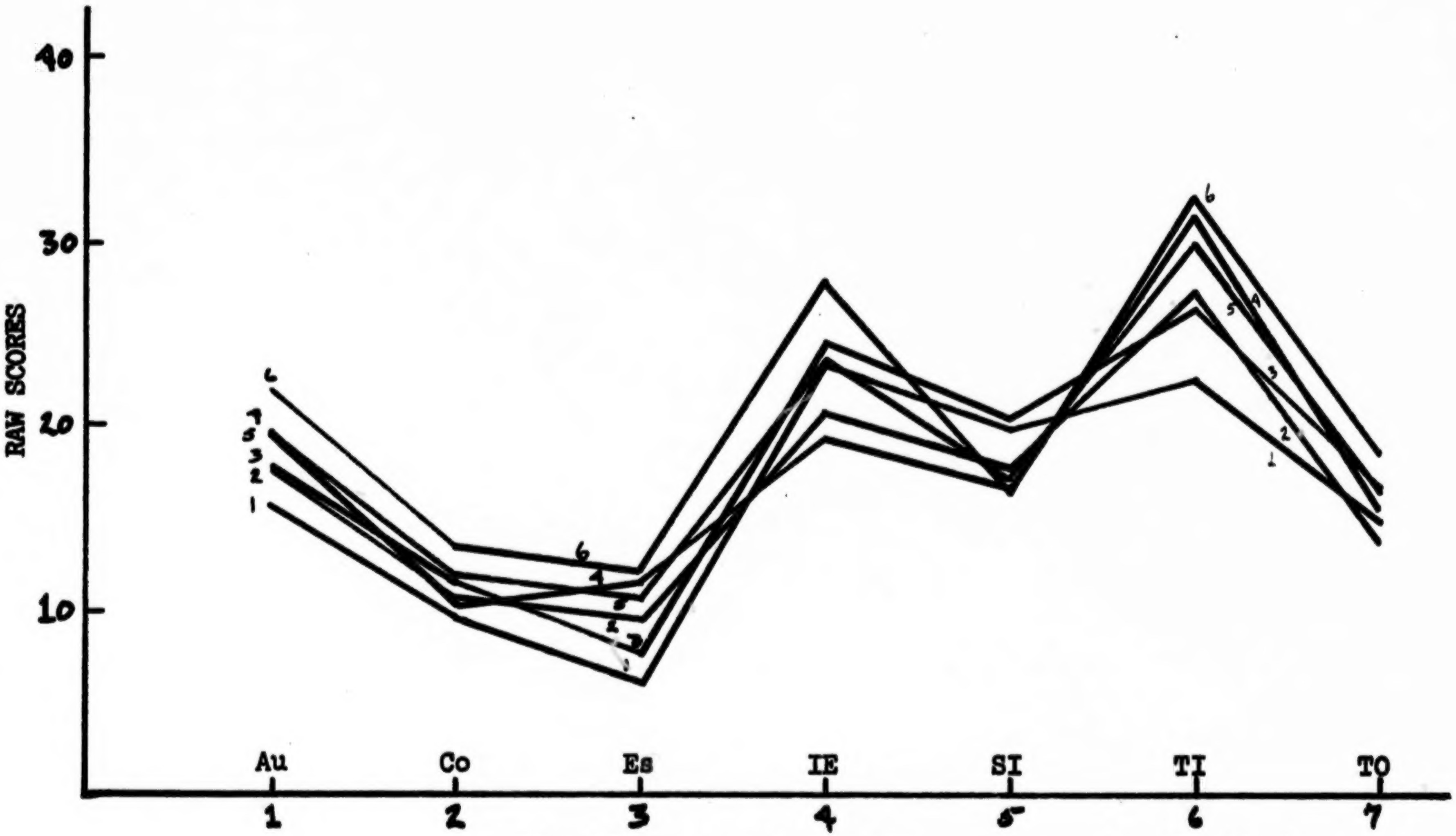

Fig. 15 Plots of mean OPI raw scores for OPI Clusters

TABLE 32

Summary of Stepwise Discriminant Analyses of OPI Scores Within Clusters

	Step Number	Variable	F-Value	U-Statistic
Cluster I				
	1	Impluse Expression	3.43	.89
	2	Thinking Introversion	2.31	.82
	3	Estheticism	1.88	.76
	4	Social Introversion	1.49	.72
Cluster II				
	1	Theoretical Orientation	4.41	.94
	2	Estheticiam	3.61	.89
	3	Social Introversion	2.02	.87
	4	Thinking Introversion	1.20	.85
Cluster III				
	1	Theoretical Orientation	3.73	.95
	2	Autonomy	2.63	.91
	3	Thinking Introversion	2.59	.88
	4	Estheticism	2.01	.86
Cluster IV				
	1	Autonomy	6.58	.93
	2	Social Introversion	3.16	.90
	3	Complexity	.83	.90
	4	Estheticism	.36	.89
Cluster V				
	1	Estheticism	5.31	.92
	2	Theoretical Orientation	8.62	.80
	3	Social Introversion	5.76	.73
	4	Autonomy	4.03	.69
Cluster VI				
	1	Theoretical Orientation	2.69	.94
	2	Social Introversion	3.07	.87
	3	Autonomy	2.88	.81
	4	Thinking Introversion	1.14	.79

were Estheticism, Theoretical Orientation and Social Introversion; in Cluster VI were Theoretical Orientation, Social Introversion and Autonomy.

OPI scales were less effective in differentiating among curricula within the respective OPI-based clusters than were IAS scales in differentiating among curricula within IAS clusters. In only two of the OPI clusters was 25 percent of the dispersion of scatter accounted for.

The percentages of cases correctly classified by OPI scores within each of the clusters are shown in Table 31. The total subjects correctly classified within each cluster varied from 10 to 53 percent. The relative effectiveness of the various OPI scales for differentiating among the curricula included in each cluster is shown in Table 32.

Discriminant analyses among the six OPI clusters indicates that over all, 26 percent of the subjects were correctly classified (Table 33). It is apparent from the data obtained from the Tryon clusters that the interest scales were relatively more effective in discriminating among the criterion groups--47 percent vs. 26 percent of the subjects correctly classified, even when clusters were based on the respective instruments. It should be remembered that these differences were obtained from clustering procedures which would tend to inflate the number of correct classifications within the respective clusters for both instruments, and would tend to reduce the effectiveness of the instruments for making within-cluster discriminations.

The degree of overlap in the first two discriminant functions, among the curricula in each cluster, is shown in figures 16 through 21. The overlap among the six OPI clusters is shown in figure 22.

The relative effectiveness of the OPI scales for differentiating among the six Tryon OPI clusters is summarized in Table 34. Note that four of the OPI scales accounted for a total of 28 percent of the dispersion matrix. Estheticism accounted for 12 percent; Impulse Expression, eight percent; Theoretical Orientation and Autonomy, an additional eight percent.

A priori clusters

The ability of the OPI scales to discriminate among the *a priori* clusters described in the analyses of the IAS, is indicated by the findings shown in Tables 35 and 36. The proportion of subjects correctly classified in each of the seven *a priori* clusters varied from eight to 42 percent. Over all clusters the proportion correctly classified was 28 percent. Again the superiority of interest variables over personality factors as represented by OPI scores is clearly evident with these occupation-oriented students.

TABLE 33

Percentage of Cases Correctly Classified Among OPI Tryon Clusters

Total OPI Cluster	Total Number of Cases	Number of Cases Classified	Percent of Cases Classified
I	59	29	49
II	284	88	31
III	1,348	370	27
IV	192	87	45
V	491	25	05
VI	85	37	44

Total Correctly Classified	636
Total Percent Classified	26

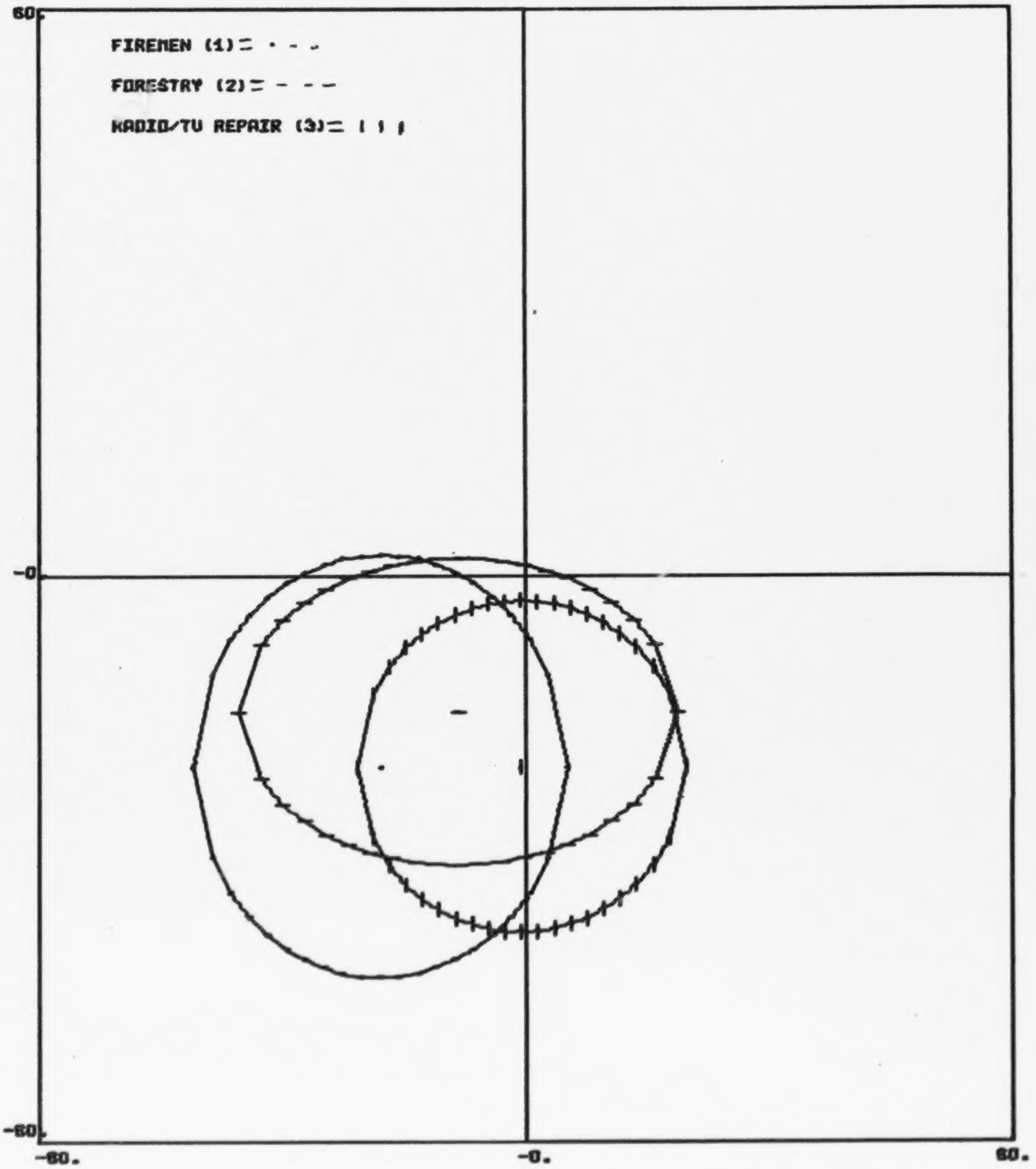

Fig. 16 - Plots of discriminant scores of curricula in OPI cluster 1.

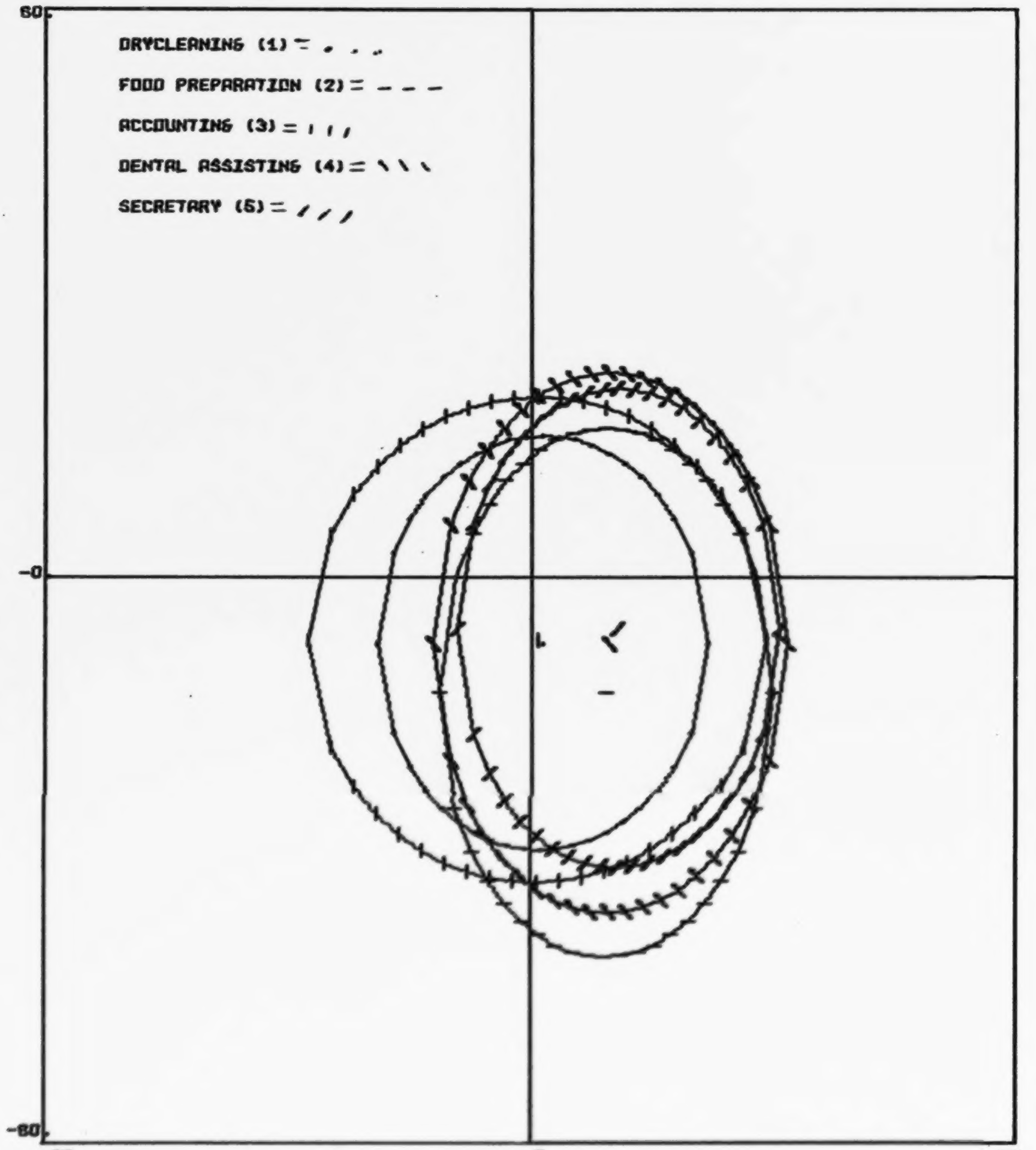

Fig. 17 - Plots of discriminant scores of curricula in OPI cluster 2.

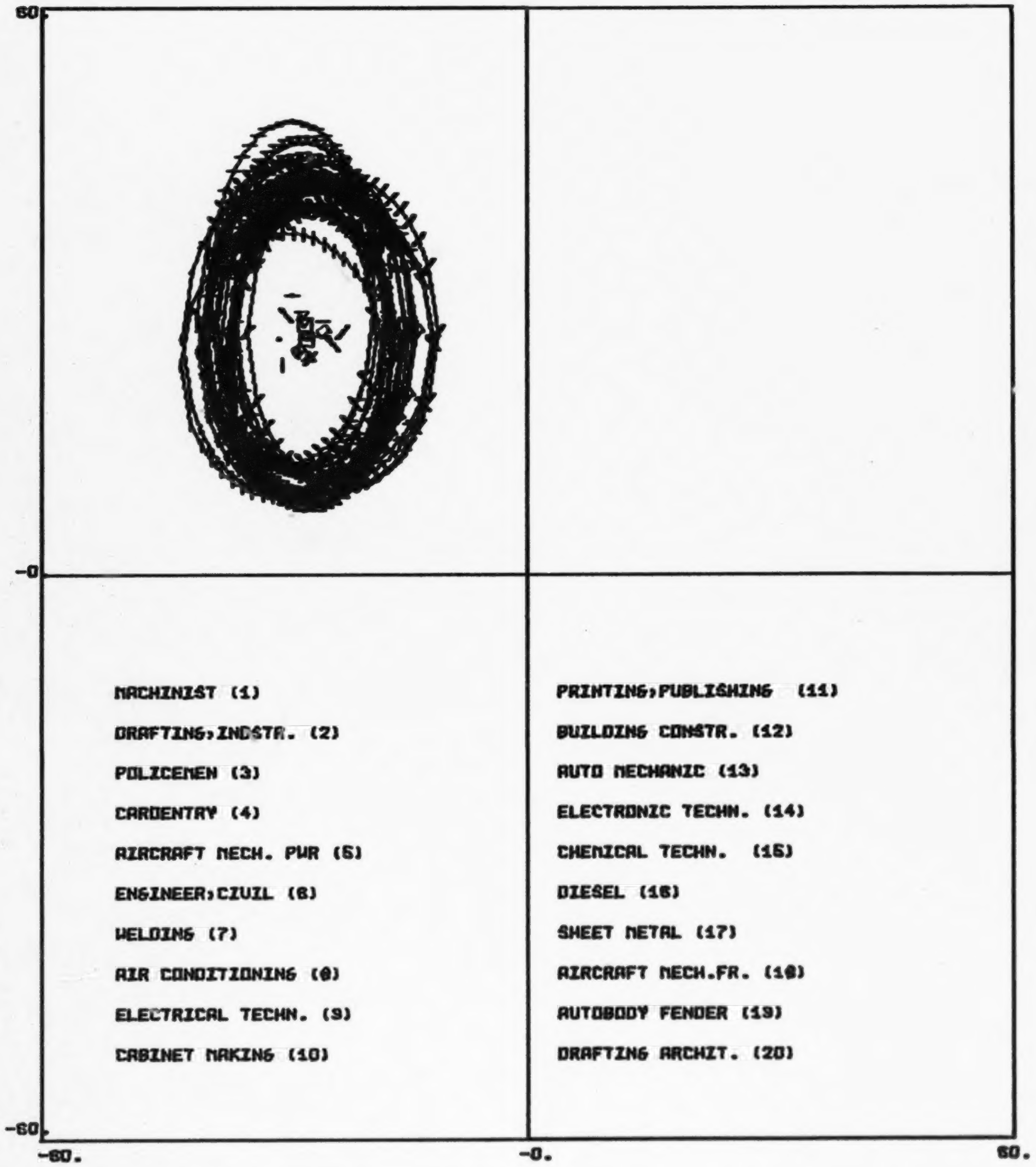

Fig. 18 - Plots of discriminant scores of curricula in OPI cluster 3.

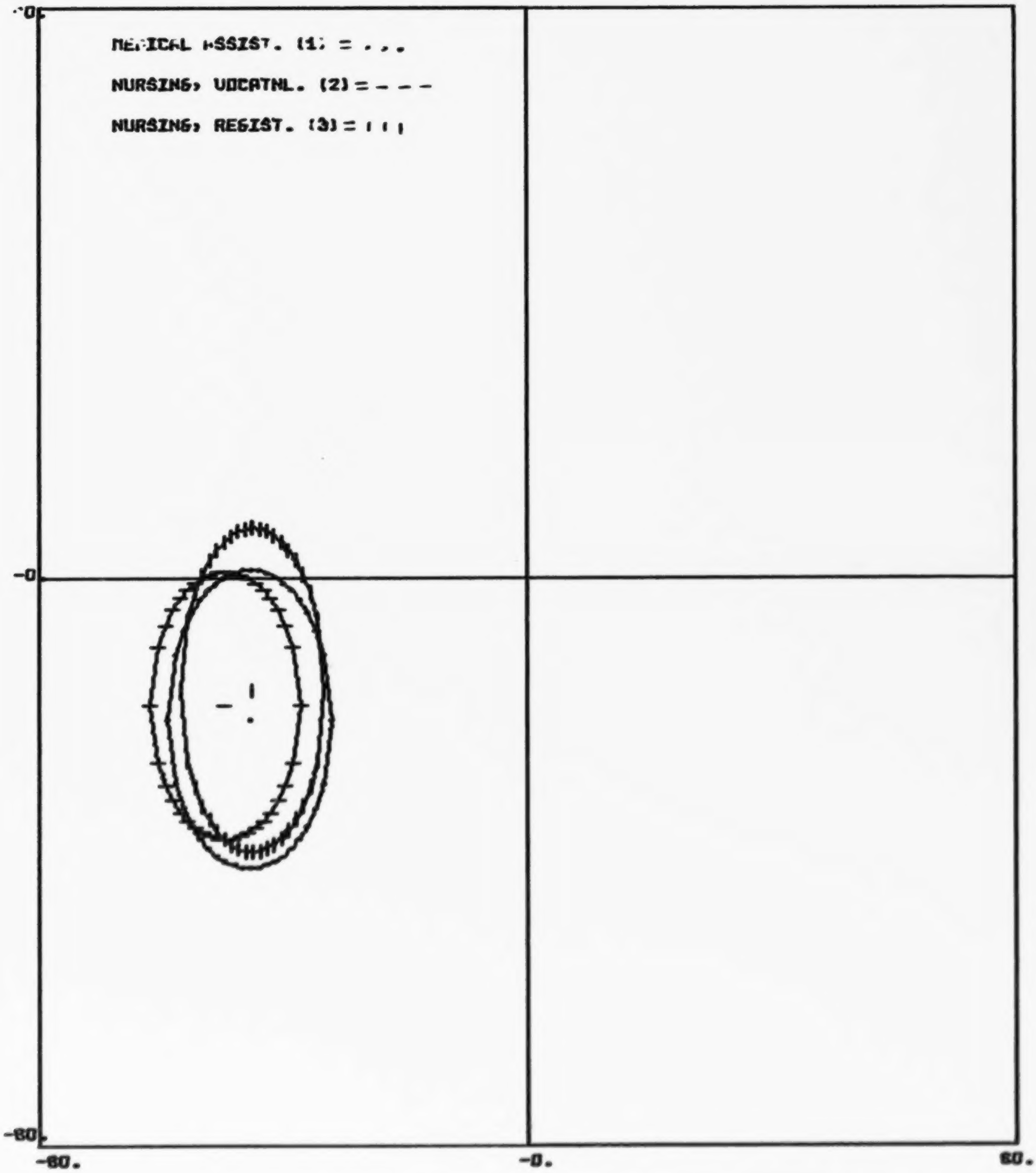

Fig. 19 - Plots of discriminant scores of curricula in OPI cluster 4.

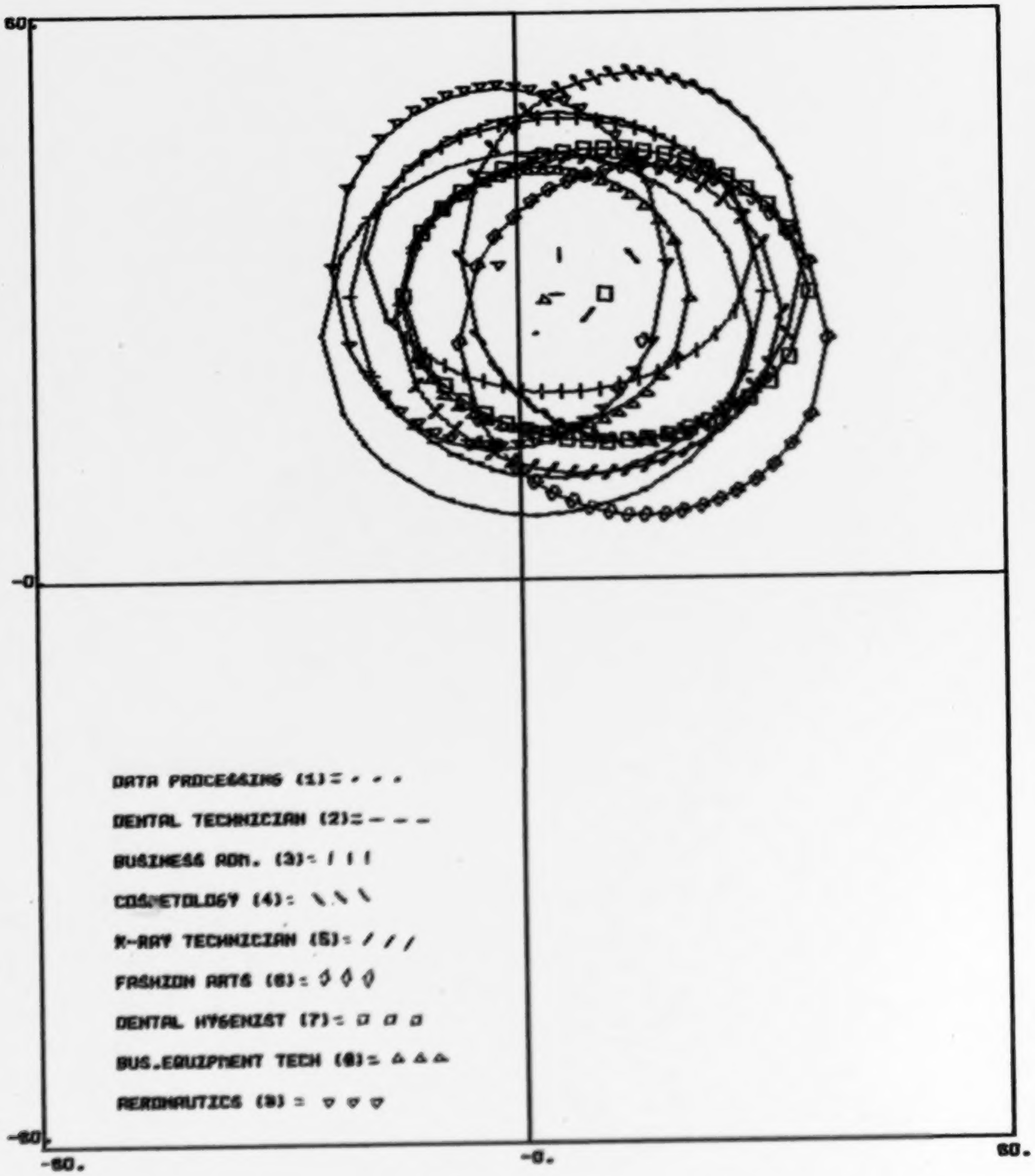

Fig. 20 - Plots of discriminant scores of curricula in OPI cluster 5.

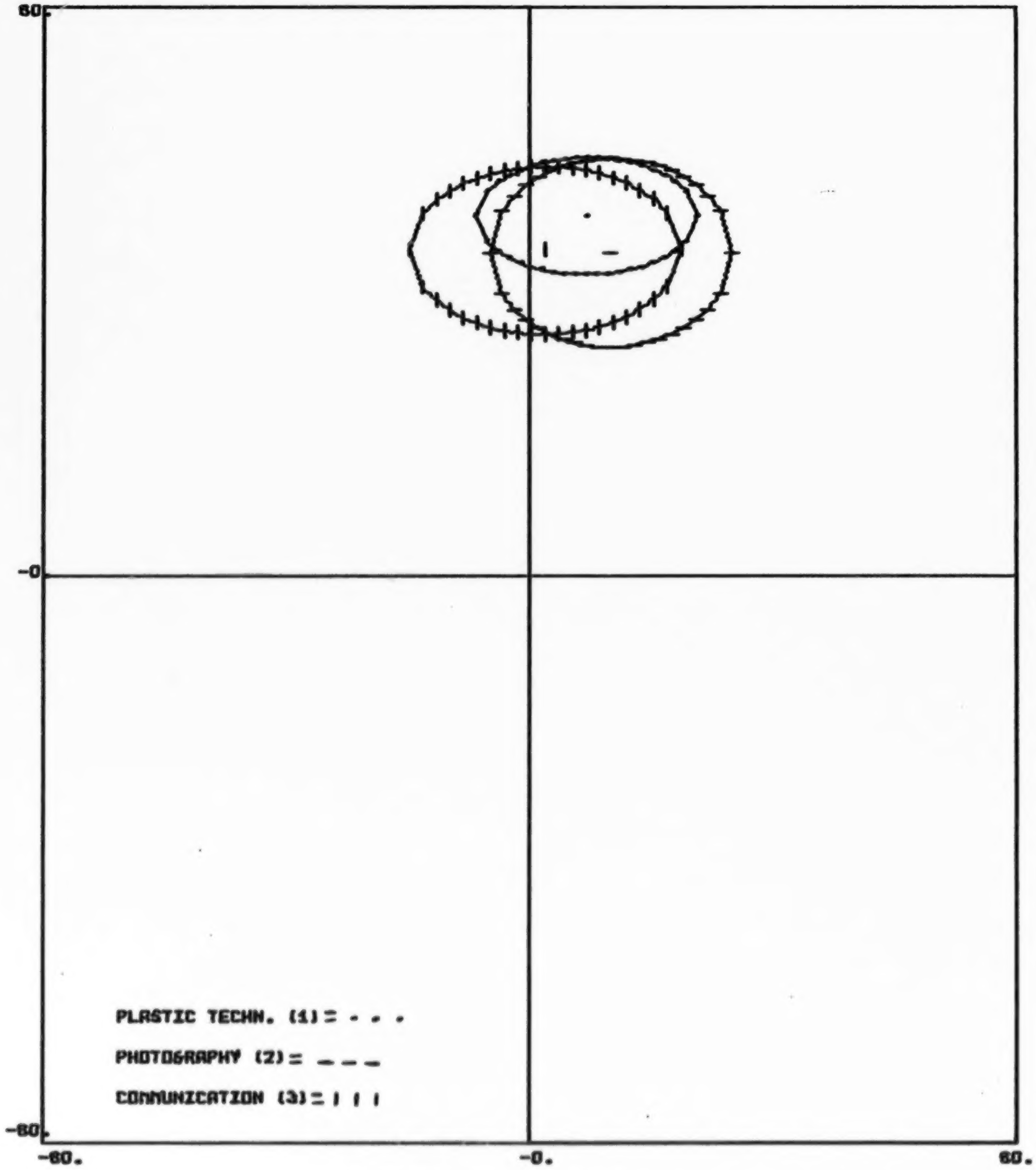

Fig. 21 - Plots of discriminant scores of curricula in OPI cluster 6.

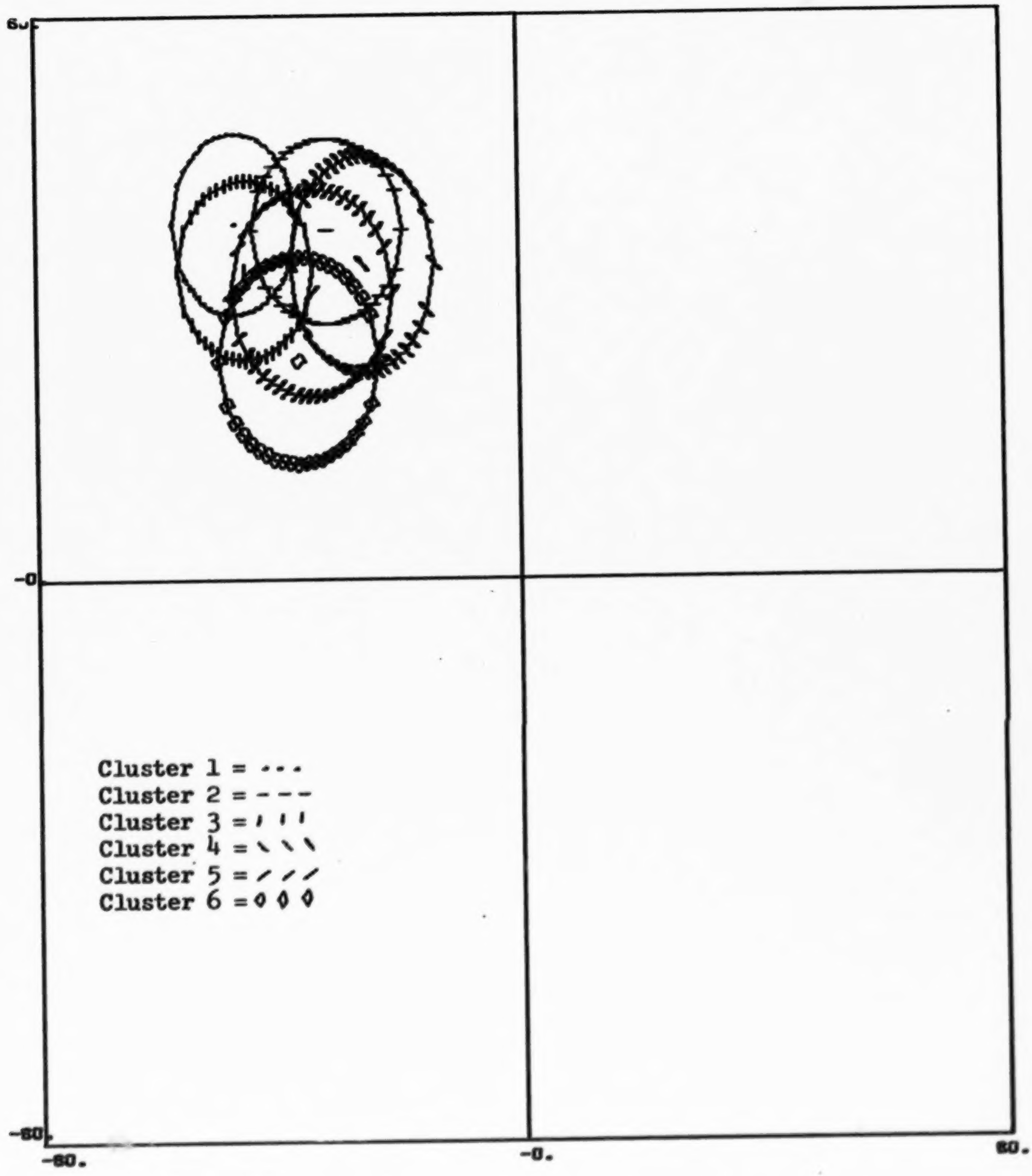

Fig. 22 - Plots for discriminant scores for OPI clusters.

TABLE 34

Summary of Stepwise Discriminant Analysis of OPI Scores Among Tryon Clusters

Step Number	Variable	F-Value	U-Statistic
1	Estheticism	64.09	.88
2	Impulse Expression	48.43	.80
3	Theoretical Orientation	33.06	.75
4	Autonomy	20.01	.72

TABLE 35

Percent of Cases Correctly Classified by Means of OPI Among Curriculum A Priori Clusters

Cluster	Number of Cases	Number Classified	Percent Classified
I	108	45	42
II	254	92	37
III	369	156	42
IV	627	83	13
V	584	204	35
VI	351	28	8
VII	166	41	25

Total Number Classified	694
Total Percent Classified	28

TABLE 36

Summary of Stepwise Discriminant Analysis of OPI Scores Among A Priori Curriculum Clusters

Variable	F-Value	U-Statistic
Estheticism	48.0	.89
Theoretical Orientation	39.2	.82
Impulse Expression	30.9	.76
Autonomy	19.4	.72
Social Introversion	15.3	.70
Thinking Introversion	4.3	.69
Complexity	2.9	.69

The relative effectiveness of the various OPI scales in discriminating among the clusters is shown in Table 36. Estheticism accounted for 11 percent of the dispersion; Theoretical Orientation for seven percent; Impulse Expression and Autonomy, for an additional 10 percent.

Plots of the OPI discriminant scores--first two functions only--are shown in figure 23. The plots include only those scores falling with plus and minus two standard deviations of the centroid or mean discriminant score. Also the plots can be shown only in two dimensions. Thus the degree of discrimination tends to be underestimated.

To provide some further indication of the nature of the curriculum groups combined in the respective a priori clusters, OPI scores were analyzed by means of stepwise discriminant analyses. The results are summarized in Tables 37 and 38. Note that the total percentage of classified over-all curriculum groups in each cluster varies from 15 for Cluster IV to 59 for Cluster 1. For some of the clusters, e.g. IV and V, the percentage classified varies greatly among the several curricula included in a given cluster, indicating a cluster mismatch with respect to OPI scales.

The ability of the respective OPI scales to discriminate among curriculum groups (Table 38) varies from cluster to cluster. For Cluster I, Thinking Introversion and Estheticism were most important; Cluster II, Social Introversion and Estheticism; Cluster III, Autonomy and Impulse Expression; Cluster IV, Thinking Introversion and Social Introversion; Cluster V, Estheticism and Authonomy; Cluster VI, Theoretical Orientation and Impulse Expression; Cluster VII, Theoretical Orientation and Autonomy.

Would combining the two intruments result in better discrimination among the a priori groups? Evidence relative to this question is shown in Tables 39 and 40. As indicated in Table 39, both instruments correctly classified 40 percent of the subjects into the respective a priori clusters. It will be recalled that the IAS alone correctly classified 37 percent over all a priori clusters. Thus, the OPI adds very little to the predictive battery. The relatively greater effectiveness of the IAS scales is further indicated in Table 40. In terms of amount of dispersion accounted for, eight of the first nine scales belong to the IAS. Autonomy ranks number five in the hierarchy but accounts for only two percent of the dispersion.

Empirical clusters

As was performed with the IAS scores, the OPI scores were grouped according to the nine empirical clusters formed from counselor sorts. The results of the stepwise discriminant analysis across the clusters--all 43 curricula included--are shown in Tables 41 and 42. The total

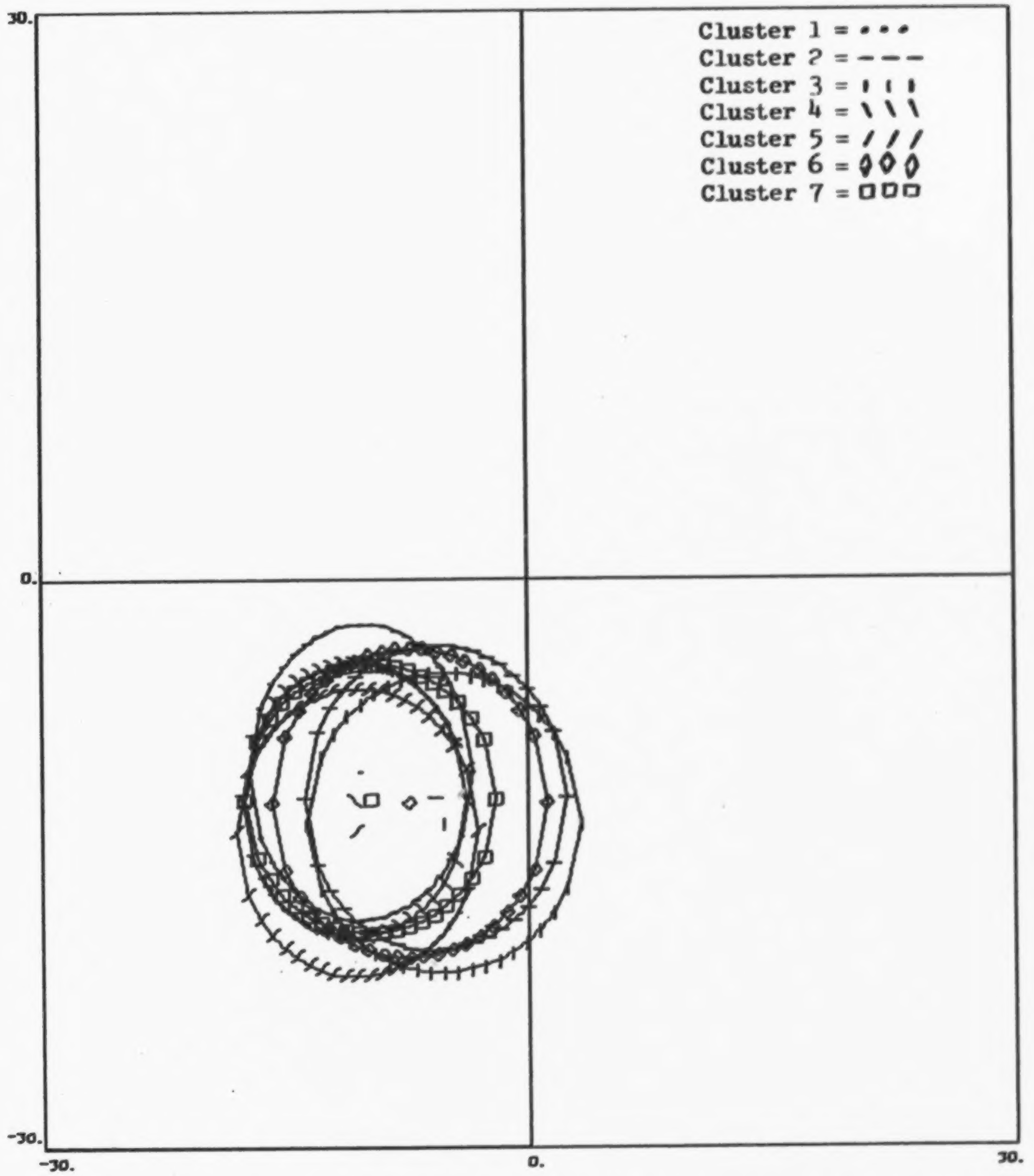

Fig. 23 - Plots of OPI discriminant scores for A Priori clusters.

TABLE 37

Subjects Within A Priori Clusters Correctly Classified by OPI Scores

	Number of Subjects	Number Classified	Percent Classified
Cluster I			
Forestry	21	8	38
Criminology	70	46	66
Fire Science	17	10	59
Total Classified	64		
Total Percent Classified	59		
Cluster II			
Cosmetology	108	51	47
Dry Cleaning	24	13	54
Fashion Arts	65	35	54
Food Preparation/Service	57	19	33
Total Classified	118		
Total Percent Classified	46		
Cluster III			
Dental Assisting	60	8	13
Dental Technology	46	20	43
Medical Assisting	72	12	17
Nursing, Registered	51	4	08
Nursing, Vocational	69	24	35
X-Ray Technology	44	5	11
Dental Hygienist	27	10	37
Total Classified	83		
Total Percent Classified	22		
Cluster IV			
Air Conditioning	75	8	11
Airpower Mechanic	50	10	20
Airframe Mechanic	53	4	08
Auto Mechanic	120	13	11
Auto Body/Fender	60	20	33

TABLE 37 (Cont.)

Cluster IV (Cont.)			
Diesel	84	20	24
Machinist	87	0	00
Sheet Metal	46	14	30
Welding	52	8	15
Total Classified	97		
Total Percent Classified	15		
Cluster V			
Aeronautics	45	2	04
Business Equip. Tech.	30	4	13
Chemical Technology	33	8	24
Drafting, Architectural	63	2	03
Drafting, Industrial	101	27	27
Electrical Technology	70	6	09
Electronics Technology	117	20	17
Engineering, Civil	50	3	06
Photography	39	15	38
Plastics Technology	15	8	53
Radio-TV Repair	21	9	43
Total Classified	104		
Total Percent Classified	18		
Cluster VI			
Accounting/Bookkeeping	36	4	11
Communications	31	11	35
Data Processing	71	30	42
Printing/Publishing	51	28	55
Secretarial	107	54	50
Business Administration	55	10	18
Total Classified	137		
Total Percent Classified	39		
Cluster VII			
Building Construction	53	27	51
Cabinet Making	65	28	43
Carpentry	48	20	42
Total Classified	75		
Total Percent Classified	45		

TABLE 38

Summary of Stepwise Discriminant Analysis Within A Priori Clusters: OPI Raw Scores

	Step Number	Scale	F-Value	U-Statistic
Cluster I				
	1	Thinking Introversion	7.66	.87
	2	Estheticism	2.72	.83
	3	Complexity	1.74	.80
	4	Impulse Expression	2.43	.76
Cluster II				
	1	Social Introversion	7.14	.92
	2	Estheticism	8.01	.84
	3	Theoretical Orientation	4.26	.80
	4	Impulse Expression	2.01	.78
Cluster III				
	1	Autonomy	4.56	.93
	2	Impulse Expression	3.27	.88
	3	Estheticism	2.77	.84
	4	Social Introversion	1.99	.82
Cluster IV				
	1	Thinking Introversion	2.12	.97
	2	Social Introversion	1.62	.95
	3	Estheticism	1.34	.94
	4	Impulse Expression	1.02	.92
Cluster V				
	1	Estheticism	7.04	.89
	2	Autonomy	4.85	.82
	3	Impulse Expression	1.71	.80
	4	Thinking Introversion	1.79	.77
Cluster VI				
	1	Theoretical Orientation	10.26	.87
	2	Impulse Expression	8.49	.77
	3	Social Introversion	6.87	.70
	4	Autonomy	3.86	.67
Cluster VII				
	1	Theoretical Orientation	1.92	.98
	2	Autonomy	2.90	.94
	3	Complexity	1.42	.93
	4	Thinking Introversion	.81	.92

TABLE 39

Cases Classified Correctly
OPI and IAS Combined--A Priori Clusters

Cluster	Number of Cases	Number Classified	Percent Classified
I	108	62	57
II	254	117	46
III	369	241	65
IV	627	167	27
V	584	226	39
VI	351	110	31
VII	166	65	39

Total Number Classified	988
Total Percent Classified	40

TABLE 40

Summary of Stepwise Multiple Discriminant Analysis Among A Priori Clusters--IAS and OPI Combined

Variable	F-Value	U-Statistic
Concrete Means	134.7	.75
Nurturance	143.5	.56
Aesthetic	37.3	.51
Influencing Others	28.4	.48
Autonomy	17.6	.46
Adventure	16.1	.44
Order	12.5	.43
Abstract	12.0	.41
Complexity	4.5	.41
Theoretical Orientation	4.5	.41
Thinking Introversion	5.1	.40
Estheticism	3.7	.40
Impulse Expression	4.4	.39
Social Introversion	3.9	.39
Written Expression	2.2	.39

TABLE 41

Percentage of Subjects Correctly Classified Among Empirical Clusters - OPI Scores

Cluster	Number	Number Classified	Percent Classified
I	408	189	46
II	269	42	16
III	166	49	30
IV	268	59	22
V	448	6	01
VI	214	49	23
VII	230	24	10
VIII	329	55	17
IX	127	3	02

Total Number Classified	476
Total Percent Classified	19

TABLE 42

Summary of Stepwise Discriminant Analysis Among Empirical Clusters Containing all 43 Curricula - OPI Scores

Step	Variable	F-Value	U-Statistic
1	Estheticism	20.8	.94
2	Impulse Expression	18.6	.88
3	Theoretical Orientation	11.6	.85
4	Autonomy	15.4	.81

percent classified was 19. This is of course less than the 26 percent obtained from the Tryon clusters and 28 percent from the a priori clusters. The order in which OPI scales discriminated among the empirical clusters is shown in Table 42. The first four scales accounted for only 19 percent of the dispersion among the nine clusters.

The OPI scores were reanalyzed for the empirical clusters with the six curricula removed for reasons explained in the section of the report dealing with the IAS; i.e., the six curricula did not appear to belong logically to their respective clusters. The results are shown in Tables 43 and 44. The total percentage classified increased to 22. Notice that removing the curricula did not change the order in which the OPI variables discriminated among the clusters. There were only slight and probably insignificant modifications in the size of the U-statistic.

To provide further indication of the relationships among curricula included within the respective empirical clusters (six curricula removed), the OPI scords were analyzed by means of discriminant analysis. The results are reported in Tables 45 and 46. The percentages correctly classified across the curricula within the clusters varied from 23 to 77. It would appear that whatever the criteria used by counselors in sorting the curricula, the resulting clusters were quite heterogeneous with respect to attributes measured by the OPI.

As is apparent in Table 46, there was a considerable degree of variation from cluster to cluster in the relative effectiveness of the respective OPI scales in discriminating among the curricula. Also the amount of dispersion accounted for by OPI scales varied greatly from cluster to cluster.

Multivariate Analyses of Variance

Tryon clusters

H_1-H_2 tests were performed with OPI scores in the same manner as with scores on the IAS. The results of the analyses with the Tryon clusters are shown in Tables 47 and 48. Note that for H_1 the F-ratio for within-cluster comparisons approached significance only for Cluster II. However, the F-ratio for the analysis across clusters was signfficant at the .01 level.

Differences in the vectors of means (H_2) within clusters were significant at the .05 level or higher for four of the six clusters. The difference in vectors of means for the six clusters was highly significant.

TABLE 43

Percent Correctly Classified by OPI Scores Among Empirical Clusters (Six Curricula Omitted)

Cluster	Number	Number Classified	Percent Classified
I	408	195	48
II	269	47	17
III	166	39	23
IV	268	21	08
V	265	73	28
VI	214	20	09
VII	108	41	38
VIII	329	11	03
IX	52	3	06

Total Number Classified	450
Total Percent Classified	22

TABLE 44

Summary of Stepwise Discriminant Analysis Across Empirical Clusters - OPI Scores (Six Scales Removed)

Step	Variable	F-Value	U-Statistic
1	Estheticism	27.0	.91
2	Impulse Expression	20.9	.84
3	Theoretical Orientation	15.6	.79
4	Autonomy	15.2	.75

TABLE 45

Percentages of Occupational Curriculum Groups Correctly Classified Within Empirical Clusters by OPI Scale (Six Curricula Omitted)

	Number	Number Classified	Percent Classified
Cluster I			
Dental Assistant	60	18	30
Dental Hygienist	27	5	19
Dental Technician	46	13	28
Registered Nurse	51	4	08
Vocational Nurse	69	25	36
Medical Assistant	72	13	18
X-Ray Technician	44	7	16
Photographers	39	23	59
	Total Classified	108	
	Total Percent	26	
Cluster II			
Accountant	36	9	25
Business Admin.	55	28	51
Secretary	107	61	57
Data Processing	71	34	48
	Total Classified	132	
	Total Percent	49	
Cluster III			
Cabinet Making	65	28	43
Carpentry	48	20	42
Building Construction	53	27	51
	Total Classified	75	
	Total Percent	45	
Cluster IV			
Airframe Mechanic	53	10	19
Airpower Mechanic	50	11	22
Aeronautics	45	25	56
Auto Mechanic	120	59	49
	Total Classified	105	
	Total Percent	39	

TABLE 45 (Cont.)

Cluster V			
Electronic Tech.	117	39	33
Electrical Tech.	70	28	40
Business Equip. Tech.	30	1	03
Chemical Tech.	33	12	36
Plastics Tech.	15	10	67
	Total Classified	90	
	Total Percent	34	
Cluster VI			
Indust. Draft.	101	42	42
Architech. Draft.	63	27	43
Civil Engineer	50	17	34
	Total Classified	86	
	Total Percent	40	
Cluster VII			
Policeman	70	46	66
Fireman	17	10	59
Forestry	21	8	38
	Total Classified	64	
	Total Percent	59	
Cluster VIII			
Welding	52	7	13
Sheet Metal	46	18	39
Machinist	87	0	00
Auto Body/Fender	60	22	37
Diesel	84	29	35
	Total Classified	76	
	Total Percent	23	
Cluster IX			
Radio-TV Repair	21	19	90
Communication	31	21	68
	Total Classified	40	
	Total Percent	77	

TABLE 46

Summary of Stepwise Discriminant Analysis of OPI Scores Within Empirical Clusters (Six Curricula Removed)

	Step Number	Variable	F-Value	U-Statistic
Cluster I				
	1	Impulse Expression	8.84	.87
	2	Autonomy	3.96	.81
	3	Theoretical Orientation	2.87	.77
	4	Thinking Introversion	3.32	.73
Cluster II				
	1	Theoretical Orientation	15.88	.85
	2	Social Introversion	8.89	.77
	3	Impulse Expression	5.62	.72
	4	Esthetic	2.44	.70
Cluster III				
	1	Theoretical Orientation	1.92	.98
	2	Autonomy	2.90	.94
	3	Complexity	1.42	.93
	4	Thinking Introversion	.81	.92
Cluster IV				
	1	Theoretical Orientation	8.96	.91
	2	Esthetic	2.19	.89
	3	Complexity	1.59	.87
	4	Social Introversion	1.73	.85
Cluster V				
	1	Esthetic	6.39	.91
	2	Autonomy	5.96	.83
	3	Social Introversion	2.63	.80
	4	Impulse Expression	1.65	.78
Cluster VI				
	1	Thinking Introversion	2.17	.98
	2	Autonomy	1.43	.97
	3	Esthetic	.90	.96
	4	Impulse Expression	.91	.95
Cluster VII				
	1	Thinking Introversion	7.66	.87
	2	Esthetic	2.72	.83
	3	Complexity	1.74	.80
	4	Impulse Expression	2.93	.76

TABLE 46 (Cont.)

Cluster VIII				
	1	Thinking Introversion	1.37	.98
	2	Esthetic	1.65	.96
	3	Impulse Expression	1.46	.95
	4	Theoretical Orientation	.96	.94
Cluster IX				
	1	Autonomy	18.18	.73
	2	Esthetic	5.68	.66
	3	Theoretical Orientation	2.71	.62
	4	Social Introversion	1.92	.60

TABLE 47

Multivariate Analysis of Variance of OPI Raw Scores
Clusters Formed by Tryon Analysis of OPI Scores

	OPI Means						
	Au	Co	ES	IE	SI	TI	TO
Cluster I							
Fireman	15.8	10.1	6.6	26.8	17.8	19.1	13.1
Forestry	16.9	10.2	4.8	23.8	20.0	21.7	14.9
Radio-TV Repair	14.7	9.6	6.7	19.9	21.4	25.8	16.2

Test for H_1: F .86 df 56, ∞ $P > .05$
Test for H_2: F 1.44 df 14,98 $P > .05$

	Au	Co	ES	IE	SI	TI	TO
Cluster II							
Dry Cleaning	17.1	10.3	8.7	20.3	18.5	27.3	15.8
Food Preparation	17.5	11.4	10.9	22.2	18.9	27.3	13.8
Accounting	18.8	10.8	8.3	21.3	18.8	26.9	15.7
Dental Assistant	18.3	11.0	10.3	20.4	16.7	29.0	14.0
Secretary	17.2	10.6	9.6	20.0	17.5	25.7	12.8

Test for H_1: F 1.20 df 112, ∞ $P > .05$
Test for H_2: F 1.80 df 28, ∞ $P < .05$

	Au	Co	ES	IE	SI	TI	TO
Cluster III							
Machinist	17.8	11.4	7.8	24.8	20.3	25.8	16.7
Drafting, Indus.	19.6	11.4	7.8	23.5	20.9	25.2	16.9
Policeman	17.5	12.1	6.9	24.1	18.0	26.5	15.5
Carpentry	16.5	11.8	9.0	24.4	20.2	27.1	15.6
Aircraft Mech. (Power)	18.6	11.6	7.0	24.3	18.4	26.0	16.9
Engineering, Civil	18.0	10.8	7.6	24.3	20.5	25.9	17.5
Welding	17.6	11.4	8.1	23.8	21.0	26.4	16.5
Air Conditioning	17.6	11.5	8.0	24.1	19.0	28.0	17.3
Electrical Tech.	16.1	11.2	8.0	23.2	19.5	26.4	17.0
Cabinet Making	17.3	11.3	8.8	23.7	20.3	26.8	16.3
Printing & Publish.	17.5	12.7	8.4	25.7	19.5	26.2	15.0
Building Construct.	15.2	11.7	9.4	24.8	19.5	28.4	17.2
Auto Mechanic	17.6	11.7	6.9	25.0	20.6	24.2	15.5
Electronic Tech.	20.0	11.5	7.4	24.8	20.7	27.1	18.3
Chemical Tech.	20.5	10.8	7.8	22.2	20.0	28.6	19.1
Diesel	17.5	11.6	6.8	24.3	21.4	25.3	15.7
Sheet Metal	18.1	11.8	8.0	26.8	19.8	26.7	16.9
Aircraft Mech. (Frame)	18.6	10.6	7.2	23.6	18.8	26.3	16.3
Auto Body	16.9	11.5	7.8	24.7	21.1	23.6	16.0
Drafting, Arch.	19.5	11.7	8.9	24.5	20.6	27.8	17.9

Test for H_1: F 1.10 df 532, ∞ $P > .05$
Test for H_2: F 2.19 df 133, ∞ $P < .01$

TABLE 47 (Cont.)

Cluster IV							
Medical Assistant	20.8	10.5	11.4	19.2	18.0	31.3	15.2
Nursing, Voc.	17.8	10.3	11.2	18.8	15.4	31.2	15.1
Nursing, Reg.	21.6	10.4	11.9	19.5	16.6	31.4	15.9

Test for H_1: F 1.02 df 56, ∞ $P > .05$

Test for H_2: F 1.70 df 14,366 $P < .05$

Cluster V							
Data Processing	21.6	11.6	9.2	22.0	19.9	30.2	17.6
Dental Tech.	19.8	11.7	9.7	23.8	18.4	29.1	16.6
Business Admin.	20.9	11.9	9.6	25.3	15.1	29.6	16.3
Cosmetology	17.2	11.8	11.4	23.8	15.2	28.5	14.6
X-Ray Technology	21.7	11.7	10.8	21.9	17.0	29.0	16.5
Fashion Arts	19.3	12.0	13.4	21.5	18.7	32.2	16.1
Dental Hygienist	22.9	11.0	11.5	21.9	14.3	31.3	16.1
Business Equip. Technology	18.6	12.7	9.7	23.5	18.3	31.3	18.0
Aeronautics	19.7	11.8	9.6	26.4	17.0	29.7	19.2

Test for H_1: F 1.03 df 224, ∞ $P > .05$

Test for H_2: F 4.48 df 56, ∞ $P < .01$

Cluster VI							
Plastic Technology	18.9	13.6	12.5	28.3	14.7	33.0	19.3
Photography	22.7	13.5	12.2	28.3	18.2	32.3	19.4
Communications	22.6	13.7	12.0	26.9	15.6	31.8	17.0

Test for H_1: F .735 df 56, ∞ $P > .05$

Test for H_2: F 1.82 df 14,152 $P < .05$

TABLE 48

Multivariate Analysis of Variance of OPI Scores Among Tryon Clusters

Scale	I	II	III	IV	V	VI
Au	15.8	17.7	18.0	20.0	19.8	22.0
Co	10.0	10.8	11.5	10.4	11.8	13.6
ES	6.0	9.7	7.8	11.5	10.7	12.2
IE	23.2	20.7	24.3	19.2	23.3	27.8
SI	19.9	17.9	20.0	16.7	17.1	16.6
TI	22.4	27.0	26.2	31.3	29.9	32.3
TO	14.8	13.9	16.6	15.4	16.5	18.5

Test for H_1: F 1.36 df 140, ∞ $P < .01$
Test for H_2: F 25.59 df 35, ∞ $P < .01$

A priori clusters

The findings for the MANOV for the a priori clusters are shown in Tables 49 and 50. None of the F-ratios for H_1 analyses within a priori OPI clusters was statistically significant. But again, the F for across-cluster comparisons is significant at the .01 level. Thus, the possibility that the factor structure underlying the OPI scale varies from curriculum to curriculum, or more correctly from cluster to cluster, must be seriously entertained. Support for differences in factor structure underlying scores of the several criterion groups, however, is not as strong for the OPI as it is for the IAS.

For the H_2 test, the differences in the profile mean OPI scores among the seven a priori clusters were highly significant (F 22.8, $P < .01$). Differences in mean profiles were significant at the .05 level or better within five of the seven clusters.

Empirical clusters

To show relationships of profiles of mean OPI scores of curriculum groups arranged somewhat differently from that of the Tryon or a priori clusters, H_1-H_2 tests were performed for the empirical clusters from which six curriculum groups had been removed. The results are shown in Tables 51 and 52. For the within-cluster analyses, the F ratio for H_1 was significant only for Cluster VIII. For Clusters III, VI and VIII the profiles of mean scores of curriculum groups included in each cluster were not significantly different.

Because of the very large numbers of possible contrasts among the 43 curricula groups, no post hoc analyses were made of differences in means for specific groups. Some assessment of the nature of the differences from curricula to curricula can be obtained by perusing the vectors of mean OPI scores presented in the relevant tables.

Questionnaire Data Analyzed According to Tryon Clusters

The data shown in Table 53 are identical to those shown in Table 30, except that the responses to the questionnaire items have been regrouped according to the OPI clusters. Only some of the striking trends will be noted.

--There was a high degree of unemployment reported by all subjects; it was highest for those in Cluster IV (medical); lowest for those in Cluster II (drycleaning, secretarial). Employed subjects tended to have jobs which could be classified as technical, clerical and sales, or service.

TABLE 49

Multivariate Analyses of Variance of OPI Raw Scores Within *A Priori* Clusters

	Au	Co	ES	IE	SI	TI	TO
Cluster I							
Forestry	17.0	10.1	4.8	23.8	20.0	22.1	14.6
Criminology	17.5	12.1	6.9	24.1	18.0	26.5	15.5
Fire Science	15.7	10.1	6.7	26.8	17.5	19.2	13.1

Test for H_1: F 1.01 df 56, ∞ $P > .05$
Test for H_2: F 2.53 df 14,156 $P < .01$

	Au	Co	ES	IE	SI	TI	TO
Cluster II							
Cosmetology	17.2	11.8	11.4	23.8	15.2	28.5	14.6
Dry Cleaning	17.1	10.3	8.7	20.3	18.5	27.3	15.8
Fashion Arts	19.3	12.0	13.4	21.5	18.7	32.2	16.1
Food Prep./Services	17.5	11.4	10.9	22.2	18.9	27.3	13.8

Test for H_1: F 1.05 df 84, ∞ $P > .05$
Test for H_2: F 3.34 df 21, ∞ $P < .01$

	Au	Co	ES	IE	SI	TI	TO
Cluster III							
Dental Assisting	18.3	11.0	10.3	20.4	16.7	29.0	14.0
Dental Technology	19.8	11.7	9.7	23.8	18.4	29.1	16.6
Medical Assisting	20.8	10.5	11.4	19.2	18.0	31.3	15.2
Nursing, Registered	21.6	10.4	11.9	19.5	16.6	31.4	15.9
Nursing, Vocational	17.8	10.3	11.2	18.8	15.4	31.2	15.1
X-Ray Technology	21.7	11.7	10.8	21.9	17.0	29.0	16.5
Dental Hygienist	22.9	11.0	11.5	21.9	14.3	31.3	16.1

Test for H_1: F .924 df 168, ∞ $P > .05$
Test for H_2: F 2.47 df 42, ∞ $P < .01$

	Au	Co	ES	IE	SI	TI	TO
Cluster IV							
Air Conditioning	17.6	11.5	8.0	24.1	19.0	28.0	17.3
Airpower Mechanic	18.6	11.6	7.0	24.3	18.4	26.0	16.9
Airframe Mechanic	18.6	10.6	7.2	23.6	18.8	26.3	16.3
Auto Mechanic	17.6	11.6	6.9	25.0	20.6	24.2	15.5
Auto Body/Fender	16.9	11.5	7.8	24.7	21.1	23.6	16.0
Diesel	17.5	11.6	6.8	24.3	21.4	25.3	15.7
Machinist	17.8	11.4	7.8	24.8	20.3	25.8	16.7
Sheet Metal	18.1	11.8	8.0	26.8	19.8	26.7	16.9
Welding	17.6	11.4	8.1	23.8	21.0	26.4	16.5

Test for H_1: F 1.13 df 224, ∞ $P > .05$
Test for H_2: F 1.14 df 56, ∞ $P > .05$

TABLE 49 (Cont.)

Cluster V							
Aeronautics	19.7	11.8	9.6	26.4	17.0	29.7	19.2
Bus. Equip. Tech.	18.6	12.7	9.7	23.5	18.3	31.3	18.0
Chemical Tech.	20.5	10.8	7.8	22.2	20.0	28.6	19.1
Drafting, Arch.	19.5	11.7	8.9	24.5	20.6	27.8	17.9
Drafting, Indus.	19.6	11.4	7.8	23.5	20.9	25.2	16.9
Electrical Tech.	16.1	11.2	8.0	23.2	19.5	26.4	17.0
Electronics Tech.	20.0	11.5	7.4	24.8	20.7	27.1	18.3
Engineering, Civil	18.0	10.8	7.6	24.3	20.5	25.9	17.5
Photography	22.7	13.5	12.2	28.2	18.2	32.3	19.4
Plastics Technology	18.9	13.6	12.5	28.3	14.7	33.0	19.3
Radio-TV Repair	14.7	9.6	6.7	19.9	21.4	25.8	16.2

Test for H_1: F 1.03 df 280, ∞ $P > .05$
Test for H_2: F 2.67 df 70, ∞ $P < .01$

Cluster VI							
Accounting/Bookkeeping	18.8	10.8	8.3	21.2	18.8	26.9	15.7
Communication	22.6	13.7	12.0	26.9	15.6	31.8	17.0
Data Processing	21.6	11.6	9.2	22.0	19.9	30.2	17.6
Printing/Publish.	17.5	12.7	8.4	25.7	19.5	26.2	15.0
Secretarial	17.2	10.6	9.6	20.0	17.5	25.7	12.8
Business Admin.	20.9	11.9	9.6	25.3	15.1	29.6	16.3

Test for H_1: F .96 df 140, ∞ $P > .05$
Test for H_2: F 5.04 df 35, ∞ $P < .01$

Cluster VII							
Building Const.	15.2	11.7	9.4	24.8	19.5	28.4	17.2
Cabinet Making	17.3	11.3	8.8	23.7	20.3	26.8	16.3
Carpentry	16.5	11.8	9.0	24.4	20.2	27.1	15.6

Test for H_1: F 1.23 df 56, ∞ $P > .05$
Test for H_2: F 1.03 df 14,314 $P > .05$

TABLE 50

Multivariate Analysis of Variance of OPI Scores Among *A Priori* Clusters

Scale	I	II	III	IV	V	VI	VII
Au	17.1	17.8	20.1	17.8	19.1	19.3	16.4
Co	11.4	11.6	10.8	11.5	11.6	11.6	11.6
ES	6.5	11.5	11.0	7.4	8.5	9.4	9.1
IE	24.5	22.5	20.5	24.6	24.3	22.8	24.3
SI	18.3	17.3	16.8	20.2	19.8	17.9	20.0
TI	24.5	29.1	30.4	25.7	27.6	28.0	27.4
TO	14.9	14.9	15.5	16.3	17.9	15.3	16.4

Test for H_1: F 1.39 df 168, ∞ $P < .01$
Test for H_2: F 22.8 df 42, ∞ $P < .01$

TABLE 51

Multivariate Analysis of Variance of OPI Raw Scores Within Empirical Clusters (Six Curricula Removed)

	Au	Co	ES	IE	SI	TI	TO
Cluster I							
Dental Assist.	18.3	11.0	10.3	20.4	16.7	29.0	14.0
Dental Hygienist	22.9	11.0	11.5	21.9	14.3	31.3	16.1
Dental Tech.	19.8	11.7	9.7	23.8	18.4	29.1	16.6
Reg. Nurse	21.6	10.4	11.9	19.5	16.6	31.4	15.9
Voc. Nurse	17.8	10.3	11.2	18.8	15.4	31.2	15.1
Med. Assist.	20.8	10.5	11.4	19.2	18.0	31.3	15.2
X-Ray Tech.	21.7	11.7	10.8	21.9	17.0	29.0	16.5
Photographer	22.7	13.5	12.[illegible]	28.2	18.2	32.3	19.4

Test for H_1: F .98 df 196, ∞ $P > .05$
Test for H_2: F 3.34 df 49, ∞ $P < .01$

	Au	Co	ES	IE	SI	TI	TO
Cluster II							
Accountant/Bookkeeping	18.8	10.8	8.3	21.2	18.8	26.9	15.7
Business Admin.	20.9	11.9	9.6	25.3	15.1	29.6	16.3
Secretary	17.2	10.6	9.6	20.0	17.5	25.7	12.8
Data Processing	21.6	11.6	9.2	22.0	19.9	30.2	17.6

Test for H_1: F 1.03 df 84, ∞ $P > .05$
Test for H_2: F 5.48 df 21, ∞ $P < .01$

	Au	Co	ES	IE	SI	TI	TO
Cluster III							
Cabinet Making	17.3	11.3	8.8	23.7	20.3	26.8	16.3
Carpentry	16.5	11.8	9.0	24.4	20.2	27.1	15.6
Building Const.	15.2	11.7	9.4	24.8	19.5	28.4	17.2

Test for H_1: F 1.23 df 56, ∞ $P > .05$
Test for H_2: F 1.04 df 14,314 $P > .05$

	Au	Co	ES	IE	SI	TI	TO
Cluster IV							
Airframe Mech.	18.6	10.6	7.2	23.6	18.8	26.3	16.3
Airpower Mech.	18.6	11.6	7.0	24.3	18.4	26.0	16.9
Aeronautics	19.7	11.8	9.6	26.4	17.0	29.7	19.2
Auto Mechanics	17.6	11.7	6.9	25.0	20.6	24.2	15.5

Test for H_1: F .87 df 84, ∞ $P > .05$
Test for H_2: F 2.44 df 21, ∞ $P < .01$

TABLE 51 (Cont.)

Cluster V							
Electronic Tech.	20.0	11.5	7.4	24.8	20.7	27.1	18.3
Electrical Tech.	16.1	11.2	8.0	23.2	19.5	26.4	17.0
Bus. Equip. Tech.	18.6	12.7	9.7	23.5	18.3	31.3	18.0
Chemical Tech.	20.5	10.8	7.8	22.2	20.0	28.6	19.1
Plastics Tech.	18.9	13.6	12.5	28.3	14.7	33.0	19.3

Test for H_1: F .96 df 112, ∞ $P > .05$
Test for H_2: F 2.98 df 28, ∞ $P < .01$

Cluster VI							
Ind. Draft.	19.6	11.4	7.8	23.5	20.9	25.2	16.9
Arch. Draft.	19.5	11.7	8.9	24.5	20.6	27.8	17.9
Civil Eng.	18.0	10.8	7.6	24.3	20.5	25.9	17.5

Test for H_1: F 1.25 df 56, ∞ $P > .05$
Test for H_2: F 1.00 df 14,410 $P > .05$

Cluster VII							
Policeman	17.5	12.1	6.9	24.1	18.0	26.5	15.5
Fireman	15.7	10.1	6.7	26.8	17.5	19.2	13.1
Forestry	16.9	10.2	4.8	23.8	20.0	21.7	14.9

Test for H_1: F .96 df 56, ∞ $P > .05$
Test for H_2: F 2.62 df 14,198 $P < .01$

Cluster VIII							
Welding	17.6	11.4	8.1	23.8	21.0	26.4	16.5
Sheet Metal	18.1	11.8	8.0	26.8	19.8	26.7	16.9
Machinist	17.8	11.4	7.8	24.8	20.3	25.8	16.7
Auto Body/Fender	16.9	11.5	7.8	24.7	21.1	23.6	16.0
Diesel	17.5	11.6	6.8	24.3	21.4	25.3	15.7

Test for H_1: F 1.30 df 121, ∞ $P > .05$
Test for H_2: F .93 df 28, ∞ $P > .05$

Cluster IX							
Radio-TV Repair	14.7	9.6	6.7	19.9	21.4	25.8	16.2
Communications	22.6	13.7	12.0	26.9	15.6	31.8	17.0

Test for H_1: F 1.19 df 28, ∞ $P > .05$
Test for H_2: F 4.72 df 7,44 $P < .01$

TABLE 52

Multivariate Analysis of Variance of OPI Scores Among Empirical Clusters (Six Curricula Removed)

	Scale						
	Au	Co	ES	IE	SI	TI	TO
I	20.34	11.09	11.09	21.22	16.90	30.57	15.87
II	19.31	11.14	9.31	21.78	17.82	27.87	15.17
III	16.38	11.55	9.05	24.27	20.02	27.40	16.39
IV	18.36	11.46	7.44	24.84	19.26	25.86	16.55
V	18.79	11.61	8.15	24.09	19.71	27.94	18.09
VI	19.22	11.36	8.10	23.96	20.71	26.14	17.34
VII	17.11	11.42	6.47	24.45	18.30	24.40	14.98
VIII	17.57	11.53	7.62	24.77	20.76	25.50	16.29
IX	19.40	12.06	9.85	24.08	17.92	29.37	16.65

Test for H_1: F 1.26 df 224, ∞
Test for H_2: F 13.39 df 56, ∞

TABLE 53

RESPONSES TO QUESTIONNAIRE ITEMS

Responses Grouped According to OPI Clusters

Item	OPI Clusters					
	I	II	III	IV	V	VI
1. If you are now employed, what is the title of your job?						
a. unemployed	44	34	44	71	56	45
b. professional	--	3	3	14	4	1
c. technical, managerial	--	21	2	3	5	12
d. clerical and sales	10	13	11	7	17	16
e. service occupations	14	8	15	4	11	9
f. farming, fishery, forestry	3	--	1	--	--	--
g. processing occupations	--	--	1	--	--	1
h. machines trades occupations	5	--	7	--	2	2
i. bench work occupations	7	1	1	--	1	2
j. structural work occupations	2	--	5	--	--	1
k. miscellaneous occupations	15	1	9	1	4	4
2. How good, in general, were your high school grades?						
a. top quarter of your class	7	14	10	23	20	19
b. second quarter of your class	48	1	43	49	44	34
c. in the third quarter	39	31	38	23	29	28
d. in the lowest quarter	2	3	4	2	3	3
3. What is your father's job?						
a. professional	3	9	8	13	12	16
b. technical, managerial	10	19	17	24	21	30
c. clerical and sales	12	10	9	9	10	9
d. service occupations	20	14	8	7	11	8
e. farming, fishery, forestry	7	8	7	5	5	4
f. processing occupations	3	1	2	1	1	2
g. machines trades occupations	8	10	14	7	7	1
h. bench work occupations	2	1	3	1	2	1
i. structural work occupations	15	12	16	17	12	14
j. miscellaneous occupations	15	7	10	9	9	7
4. What is your mother's job?						
a. professional	7	8	7	14	10	9
b. technical, managerial	2	4	4	4	4	12
c. clerical and sales	27	25	18	26	21	18
d. service occupations	7	8	8	6	9	7

e. farming, fishery, forestry	--	--	--	--	1	1
f. processing occupations	2	2	1	1	--	1
g. machines trades occupations	2	2	3	1	2	2
h. bench work occupations	3	3	2	2	2	--
i. structural work occupations	--	--	--	--	--	--
j. miscellaneous occupations	51	45	51	45	50	48

5. Most of my friends (check one):

a. dropped out of high school	--	3	3	1	2	3
b. graduated and got a job	20	16	25	30	23	16
c. entered junior college to learn a trade	29	21	19	12	10	8
d. entered junior college with plans to transfer to state college or university	22	31	30	27	36	41
e. entered military service	14	6	10	1	3	3
f. entered a four-year college	7	12	7	24	19	25
g. other	5	3	3	2	4	2

6. How far did your father get in school?

a. 00	--	--	1	--	1	2
b. 01	--	--	--	--	--	--
c. 02	2	--	--	1	--	--
d. 03	--	1	--	1	1	1
e. 04	3	1	1	1	2	--
f. 05	--	1	1	1	1	--
g. 06	3	5	3	6	4	4
h. 07	3	3	1	1	1	--
i. 08	5	8	9	8	8	7
j. 09	--	4	4	4	2	1
k. 10	3	5	5	5	5	6
l. 11	3	6	4	5	4	1
m. 12	46	34	35	28	27	26
n. 13	3	4	2	1	3	3
o. 14	3	8	6	12	8	13
p. 15	--	1	1	1	1	3
q. 16	7	8	11	14	16	19
r. 17	--	1	--	--	--	--
s. 18	--	2	1	1	1	2
t. 19	--	--	--	1	--	--
u. 20	--	1	1	1	2	1

7. How far did your mother get in school?

a. 00	--	1	1	--	1	--
b. 01	--	--	--	--	--	--
c. 02	--	--	--	--	--	--
d. 03	--	1	1	1	1	3
e. 04	--	--	1	--	1	--
f. 05	2	--	--	1	--	1
g. 06	3	4	3	4	3	4
h. 07	--	1	1	1	1	--
i. 08	5	6	6	11	5	4
j. 09	2	2	3	2	3	--
k. 10	--	8	4	4	5	2
l. 11	2	2	3	4	3	2
m. 12	52	40	42	38	42	40
n. 13	2	4	3	5	4	2
o. 14	8	9	8	12	9	16
p. 15	--	1	1	1	2	2
q. 16	5	8	9	10	11	10
r. 17	--	--	--	1	1	--
s. 18	2	1	--	1	1	3
t. 19	--	--	--	--	--	--
u. 20	--	--	--	--	--	--

8. How sure are you that you will continue in this field?

a. very sure	51	50	43	70	58	46
b. quite sure	24	30	34	21	59	34
c. somewhat sure	17	14	14	4	11	18
d. not at all sure	3	4	6	3	3	2

9. Suppose that in about 15 years you could make good in whatever job you chose. What job would you choose?

a. professional	34	26	37	77	40	22
b. technical, managerial	12	24	17	16	27	66
c. clerical and sales	--	28	1	1	6	--
d. service occupations	20	13	5	1	14	--
e. farming, fishery, forestry	5	--	1	--	1	--
f. processing occupations	--	--	--	--	--	1
g. machines trades occupations	--	--	16	--	1	--
h. bench work occupations	12	--	1	--	2	--
i. structural work occupations	3	--	13	1	--	1
j. miscellaneous occupations	--	1	2	2	3	--

10. Please tell as near as you can remember when you decided what field of work to enter.						
a. before junior high school	5	4	--	16	8	4
b. during junior high school	14	12	11	11	10	3
c. during senior high school	49	49	45	38	39	49
d. in junior college	20	29	26	24	35	35
e. I have not yet decided	7	2	8	1	3	3
f. other	--	1	2	1	2	3
11. If you had your choice, which of the following kinds of jobs would you pick?						
a. a job which doesn't pay much money but which you were sure of keeping	36	47	34	43	30	14
b. a job which pays good money but which you have a 50-50 chance of not being able to hold down.	25	34	36	42	37	35
c. a job which pays real good money if you can keep it, but one in which chances of failure are high.	32	18	28	12	31	48
12. If you were back in high school now, what would you do differently?						
a. take a college preparatory program	39	27	31	31	34	32
b. take a vocational program	20	10	19	6	8	14
c. take a business program	2	24	--	7	15	9
d. take a general program	12	8	7	5	6	8
e. study harder or get help on study problems	56	54	57	54	56	47
f. learn more about chances for certain jobs	41	36	28	25	28	20
g. ask help from teachers or counselors with my problems	34	22	26	29	28	29
h. choose different friends	10	8	6	7	8	3
i. take more active part in out-of-class activities	32	37	29	31	38	32
j. take less active part in out-of-class activities	3	2	4	2	3	2
k. take different subjects in same program	12	12	12	14	12	13
l. take high school more seriously	59	41	56	37	51	47
m. would not do anything different	8	13	10	12	10	14
n. other	8	7	9	10	11	10

13. What three activities in your life do you expect to give you the most satisfaction? Please write a "1" next to the most important; a "2" next to the second most important; "3" next to the third most important; place a "0" next to the least important.

a. occupation or job						
"1"	36	19	31	10	23	36
"2"	30	41	30	44	36	28
"3"	19	19	15	26	20	14
"0"	2	1	--	1	1	--
b. making money						
"1"	12	6	10	1	7	6
"2"	22	15	21	9	18	33
"3"	17	15	19	13	18	21
"0"	3	11	3	14	7	4
c. marriage and family life						
"1"	44	64	42	73	61	42
"2"	27	14	24	12	18	40
"3"	8	10	16	5	8	12
"0"	--	3	3	1	1	3
d. leisure time play activities: hobbies, outdoor living, sports						
"1"	8	3	7	2	3	2
"2"	10	11	12	8	12	8
"3"	34	23	24	21	23	26
"0"	2	3	4	6	4	3
e. religious activities						
"1"	2	5	3	8	2	3
"2"	7	10	4	17	8	2
"3"	12	12	7	16	9	4
"0"	7	8	9	6	11	27
f. taking part in affairs of your community						
"1"	--	--	--	--	--	--
"2"	2	3	10	3	1	1
"3"	2	4	4	5	5	6
"0"	5	8	8	6	7	3
g. taking part in activities directed toward making world conditions better						
"1"	--	--	1	3	1	3
"2"	3	2	2	3	2	3
"3"	2	4	4	1	4	6
"0"	12	14	9	8	13	14

h. literature, art, music						
"1"	2	--	1	1	1	4
"2"	--	2	1	3	2	7
"3"	--	6	3	8	7	7
"0"	32	21	24	9	15	9
i. other						
"1"	--	1	1	2	2	1
"2"	--	1	1	1	4	--
"3"	5	2	1	3	1	2
"0"	--	1	1	3	1	4

14. Before each of the following vocations put the number that tells what you as a high school senior, thought were your chances of success in that vocation.

a. skilled craftsman (carpenter, painter, mechanic, etc.)						
1. no chance	3	49	5	57	34	22
2. slight chance	20	15	8	14	15	9
3. fair chance	36	14	31	16	23	40
4. very good chance	37	11	51	5	21	25
b. managerial (business position, etc.)						
1. no chance	20	7	18	14	12	6
2. slight chance	34	22	36	30	22	28
3. fair chance	34	39	32	34	42	36
4. very good chance	3	25	6	19	17	27
c. unskilled laborer						
1. no chance	19	43	31	50	43	45
2. slight chance	20	13	14	14	13	10
3. fair chance	19	14	12	6	11	9
4. very good chance	30	19	31	24	24	28
d. high-level professional (doctor, lawyer, etc.)						
1. no chance	54	41	45	24	32	28
2. slight chance	30	29	32	28	28	28
3. fair chance	5	16	11	28	21	19
4. very good chance	2	5	53	14	12	20
e. service (domestic, railroad porter, etc.)						
1. no chance	24	38	29	37	34	55
2. slight chance	34	10	27	21	24	19
3. fair chance	24	16	20	9	16	15
4. very good chance	8	15	13	18	15	14

f. athlete (ball player, etc.)

1. no chance	37	52	32	56	52	43
2. slight chance	19	25	27	22	23	25
3. fair chance	25	11	22	9	13	19
4. very good chance	12	4	11	4	5	6

g. semi-skilled worker (assembly-line worker, etc.)

1. no chance	5	19	7	26	21	26
2. slight chance	20	29	23	21	22	20
3. fair chance	39	26	35	26	28	25
4. very good chance	25	15	25	16	20	22

h. white-collar worker (sales clerk, etc.)

1. no chance	19	6	15	6	9	9
2. slight chance	20	11	25	8	12	21
3. fair chance	37	38	36	38	37	36
4. very good chance	17	37	15	42	30	29

15. As a high school senior, what did you think your chances of success were in the following types of schools?

a. junior college with the idea of changing later to a 4-year college or university

1. no chance	8	9	7	8	7	7
2. slight chance	15	16	18	14	14	9
3. fair chance	49	39	39	30	34	33
4. very good chance	24	29	28	42	39	48

b. junior college (job program)

1. no chance	--	1	3	5	5	9
2. slight chance	10	7	7	3	5	10
3. fair chance	14	23	29	25	26	16
4. very good chance	69	62	53	60	58	49

c. state college

1. no chance	15	18	14	12	11	16
2. slight chance	37	27	33	21	24	22
3. fair chance	32	37	34	35	35	35
4. very good chance	2	10	11	24	22	20

d. University of California

1. no chance	52	47	46	32	40	41
2. slight chance	29	34	32	39	25	28
3. fair chance	5	10	9	19	17	16
4. very good chance	3	2	4	8	10	12

e. private college or university

1. no chance	61	47	53	35	40	36
2. slight chance	24	23	25	23	21	33
3. fair chance	8	18	10	23	20	16
4. very good chance	--	4	4	12	12	12

--There was a considerable degree of variation in reported high school performance. Relatively more of those in Clusters IV, V and VI indicated that their grades were in the top quarter while more of those in Clusters I, II and III were in the third quarter.

--Fathers of subjects in all clusters were employed in jobs representing the entire spectrum of job levels. There was, however, a tendency for more of those in Clusters IV, V and VI to report that their parents were employed in professional or in technical and managerial level jobs.

--Relatively more of Clusters I, II and III reported that their peers entered junior college to learn a trade. Four out of ten of those in Cluster VI indicated that their friends entered junior college with plans to transfer to a four-year institution; one out of four of this cluster reported that their peers had entered a four-year college. Roughly only one out of fourteen of those in Clusters I and III indicated that their friends had entered a four-year college.

--Parents of subjects in Clusters IV, V and VI tended to have a higher level of education than did those of subjects in the other three clusters. This was indicated by responses with regard to parents and to parental employment. Subjects from these three clusters tend to come from higher socio-economic backgrounds.

--A high percentage of subjects in all clusters indicated that they were quite certain of continuing in the field represented by the curriculum in which they were enrolled.

--In general, most subjects indicated that their vocational plans were made either in high school or in junior college. Slightly more of those in Clusters V and VI decided after they entered junior college.

--More subjects in Cluster IV tended to have preference for moderate risk jobs; more subjects in Clusters II and IV, low risk jobs; more subjects in Clusters I, III, V and VI, high risk jobs. The trend was especially pronounced for those in Cluster VI (48 percent).

--With respect to source of life satisfactions, more subjects in Clusters I, III and VI indicated jobs; mmore of those in II, IV and V, marriage and family. Relatively few of the subjects of any cluster indicated that they expected to obtain their major life satisfaction from religious activities, community affairs, activities directed toward improving world conditions or from the arts.

--There was a great deal of variation among the clusters with respect to the subjective probability of success at certain occupational levels. Also their estimates of their success in junior colleges tended to be high; of their success in the University of California or in a private college, low.

FINDINGS--EMPLOYED GRADUATES AND APPRENTICES

Graduates vs. Current Students

Are graduates of the trade and industrial training programs who actually enter jobs related to their educational programs similar to students currently enrolled? Findings indicating that students and employed graduates are similar would further indicate the importance of the findings based only on students, i.e., such findings have relevance for actual job entry. Information relative to this question is provided in the following analysis.

As noted in the methodology section of this report, obtaining data from graduates proved to be the most difficult part of the entire project. Most California junior colleges have not maintained adequate records from which to identify graduates to be sampled for follow-up studies. Graduates appear to be quite mobile. Their skills are in demand in many parts of the country. As the labor market changes, they can easily transfer to another labor market area. There is also a lack of institutional ties. Judging from the lack of records and lack of contact with graduates, it would seem unlikely that there is much institutional loyalty among the alumni. Thus the absence of enthusiastic response to appeals for information and the low response rate is understandable.

As indicated in Table 2, usable data were obtained from 296 graduates representing 28 curricula. Because of small N's in some of the curriculum groups (N's vary from 1 to 29) comparisons of students and graduates on a curriculum-by-curriculum basis were not possible. Instead, comparisons were made between the total sample of graduates and a random subsample of 296 students preparing to enter the same 28 occupations. If, for example, five graduates were carpenters, then five students were drawn at random from the available pool of carpentry students.

The appropriate analysis for determining the similarity of the two groups on IAS and OPI scores appeared to be the multivariate analysis of variance. The results of this analysis are shown in Tables 54 and 55.

Note that for the IAS the test for H_1, equality of variance-covariance matrices, is not significant. Therefore, it seems safe to say that factor structure underlying the scales for the two groups is similar. The F-test for the differences between the two vectors of means is significant. Yet, it should be pointed out that the differences in mean scores on any one scale do not exceed a maximum of two raw score points. While the differences in means are ststistically significant, the magnitude of the differences does not appear to have any practical meaning.

TABLE 54

Multivariate Analysis of Variance of Mean IAS Scores for Graduates and a Comparison Sample of Students (N=269 in each group)

Scale	Graduate Means	Student Means
Adventure	52.8	53.1
Order	41.1	38.9
Influencing Others	46.2	44.9
Nurturance	48.9	47.4
Concrete Means	53.8	51.9
Written Expression	34.0	34.3
Abstract Ideas	47.5	47.9
Aesthetic	45.7	44.9

Test for H_1: F 1.16 df 36, ∞ $P > .05$
Test for H_2: F 1.72 df 8, ∞ $P > .05$

TABLE 55

Multivariate Analysis of Variance of Mean OPI Scores for Graduate and a Comparison Sample of Students (N=269 in each sample)

Scale	Graduate Means	Student Means
Autonomy	20.0	21.1
Complexity	11.2	11.2
Estheticism	8.9	8.9
Impulse Expression	24.4	25.6
Social Introversion	19.4	20.8
Thinking Introversion	28.7	29.3
Theoretical Orientation	16.6	16.8

Test for H_1: F 2.59 df $28, \infty$ $P < .01$
Test for H_2: F 10.04 df $7, \infty$ $P < .01$

Findings with respect to OPI scores are shown in Table 55. The F-ratios for both H_1 and H_2 were statistically significant. Taken at face value, it would appear that the samples of graduates and students did differ on OPI scores. Yet as with the IAS scores, differences in vectors of means were small, or in some cases non-existant. In view of problems involved with sampling graduates, the investigator is inclined to discount the observed differences on both instruments. There would seem to be no logical grounds for expecting OPI items to provide different stimuli for students and graduates. However, further study of possible differences between employed graduates and currently enrolled students would seem warranted, once junior college records make possible systematic sampling of former students.

Apprentices vs. Students

As shown in Table 3, 62 apprentices completed the study instruments. It was felt that entering an apprenticeship program might well indicate a firmer career committment on the part of the individual than would enrolling in a regular occupation-oriented curriculum. For comparative purposes, a random sample of 62 students from curricula similar to the apprenticeship programs was drawn. Their IAS and OPI scores were analyzed by means of the multivariate analysis of variance.

The results of the analysis for IAS scores are shown in Table 56. Neither the F-ratio for H_1 nor H_2 was significant. The H_1H_2 test for OPI scores is shown in Table 57. Again the F-ratios for both H_1 and H_2 did not reach the .05 level of significance. Thus, it seems safe to conclude that apprentices and currently enrolled students did not differ either in mean scores or in underlying factor structure. With respect to variables assessed by the OPI and IAS, the two groups could well be considered equivalent for the purpose of further analysis involving these two instruments.

TABLE 56

Multivariate Analysis of Variance of IAS Scores
Apprentices and Random Sample of Students

	Mean IAS	
	Apprentices (N=62)	Students (N=62)
Adventure	54.3	57.0
Detail	43.1	43.8
Influence	44.7	47.6
Nurturance	48.0	51.4
Concrete	57.0	56.5
Written Expression	33.9	39.7
Abstract	50.5	49.1
Aesthetic	44.0	50.3

Test for H_1: F .85 df 36, ∞ $P > .05$
Test for H_2: F 1.90 df 8,115 $P > .05$

TABLE 57

Multivariate Analysis of Variance of OPI Scores Apprentices and Random Sample of Students

	Mean OPI	
	Apprentices (N=62)	Students (N=62)
Au	17.7	16.5
Co	11.0	10.5
ES	8.2	9.3
IE	23.2	23.1
SI	19.1	18.0
TI	28.3	27.8
TO	17.3	16.7

Test for H_1: F 1.29 df 28, ∞ $P > .05$
Test for H_2: F .95 df 7,116 $P > .05$

FINDINGS--HAWAIIAN STUDENTS

Comparisons Among Hawaiian Criterion Groups

IAS scores were obtained from 658 students enrolled in occupation-oriented curricula at Kapiolani Community College in Honolulu. The eight curriculum groups and the number of subjects in each are shown in Table 58. The inventory was administered to intact classes. Due to time limitations, the OPI and biographical questionnaire were not administered.

As with the California sample, the ability of the IAS scales to discriminate among the Hawaiian curriculum groups was determined by means of stepwise discriminant analysis. The results of this analysis are shown in Tables 58 and 59. Over all, approximately one third (30 percent) of the students could be correctly classified as to their respective curricula by means of the IAS scores. Within the several curricula, the proportion of students correctly classified varied from 12 percent for general clerical workers to 54 percent for dental assistants.

Four IAS scales were particularly important in discriminating among the criterion groups. As can be observed in Table 59, Nurturance accounted for 13 percent of the dispersion; Influencing Others, 10 percent; Concrete Means, 4 percent; and Order, 5 percent.

In order to provide a visual representation of the degree of overlap among the eight criterion groups, plots of the first two discriminant functions are presented in Figure 24. As with the plots described earlier, these were made by locating the centroid or mean discriminant scores on the two axes and then constructing the elipses so as to include points plus and minus two standard deviations from each centroid.

The H_1 H_2 test for the vectors of mean scores of the Hawaiian subjects are shown in Table 60. The F-ratio for H_1 was significant at the .01 level, indicating the possibility of differences in factor structure underlying the score of the eight curriculum groups. The F-ratio for H_2, the test for differences in vectors of means, was also highly significant. The nature of the difference is apparent in the range of means scores among the curricula. Note, for example, the range of 13 points in mean scores for the Nurturance scale, which incidentally was the most important scale in differentiating among the curricula.

Comparison with California Sample

With respect to interests, are Hawaiian students enrolled in occupation-centered curricula different from California students en-

TABLE 58

Hawaiian Subjects Correctly Classified by IAS Scores

Curriculum	Total Number Subjects	Number Classified	Percent Classified
Accounting	180	58	32
Clerical, General	103	12	12
Data Processing	58	17	29
Dental Assisting	13	7	54
Food Preparation/Service	18	6	33
Nursing, Vocational	56	29	52
Secretarial	203	60	30
Middle Management	27	11	41

Total Correctly Classified	200
Percent Correctly Classified	30

TABLE 59

Summary of Stepwise Discriminant Analysis of IAS Scores Grouped According to Hawaiian Curriculum Groups

Variables	F-Value	U-Statistic
Nurturance	14.0	.87
Influencing Others	11.4	.77
Concrete Means	6.1	.73
Order	5.7	.68
Aesthetic	5.1	.65
Abstract Ideas	3.7	.62
Written Expression	2.9	.60
Adventure	2.1	.59

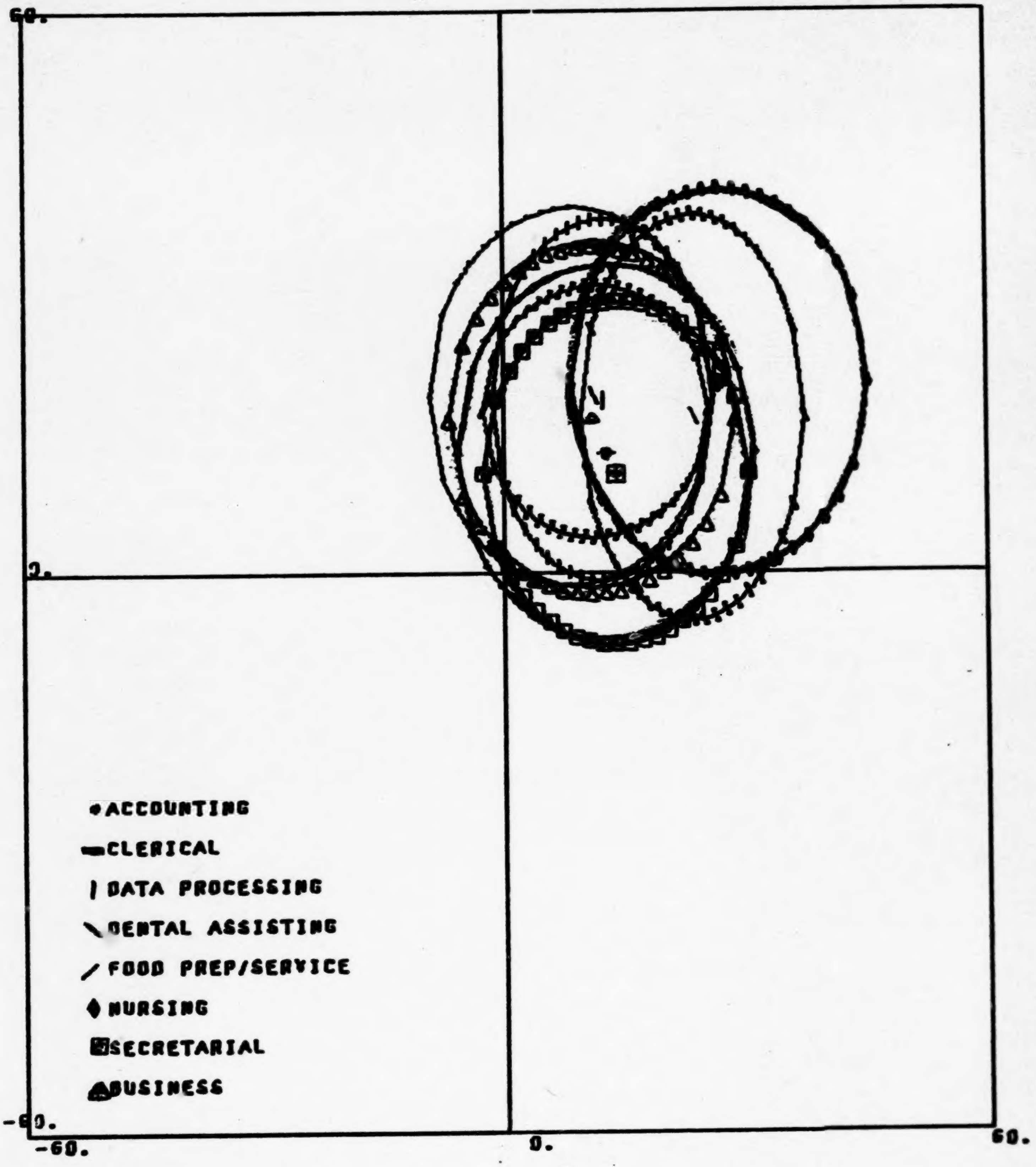

Fig. 24 - Plots of IAS discriminant scores for Hawaiian groups.

TABLE 60

Multivariate Analysis of Variance of Mean IAS Raw Scores Among Curriculum Groups -- Hawaiian Subjects

Curriculum	Adv	Ord	Infl	Nurt	Conc	Writ Exp	Abst	Aes
Accounting	52.8	48.5	49.2	52.0	46.0	37.1	45.1	44.9
Clerical	50.3	44.4	47.7	53.0	42.1	39.2	41.6	50.5
Data Processing	53.4	43.7	45.0	52.4	45.0	35.4	41.8	47.0
Dental Assisting	57.4	43.7	46.4	61.8	47.5	49.8	51.5	63.9
Food Processing	55.0	46.9	53.8	56.7	48.5	39.2	46.3	50.8
Nursing, Voc.	55.4	40.9	42.1	65.5	42.2	40.2	45.8	53.9
Secretarial	50.2	45.8	48.3	55.0	40.3	40.8	40.2	51.6
Business Admin.	57.3	43.4	53.4	54.1	45.5	38.1	46.2	51.8

Test for H_1: F 1.40 df 252, ∞ $P < .01$
Test for H_2: F 6.38 df 56, ∞ $P < .01$

rolled in similar curricula? Answers to this question would help determine the extent to which the findings based on California subjects can be generalized to other populations.

Because not all curricula were represented in both samples, 283 subjects were randomly drawn from matching curricula as shown in Table 61. Similarity of the two samples was determined by means of multivariate analysis of variance.

The results of this analysis are shown in Table 62. The F-ratios were statistically significant for both H_1 and H_2. Thus it would appear that the two rather disparate samples from the two states differ certainly with respect to mean IAS scores and possibly with respect to the factor structure underlying them. It will be recalled that significant differences between students and employed graduates for H_2 on IAS and for both H_1 and H_2 on OPI were observed and that these H_1 differences tended to be discounted because of sampling problems. The possibility of real differences between California and Hawaii students in factor structure as well as vectors of means on the interest scales must be more seriously entertained. Differences in mean scores for Hawaiians and Californians, while relatively small, tend to be larger than those obtained between students and graduates. Also, both Hawaiian and Californian student groups represent fairly adequate samples of enrollees in occupation-centered curricula since both were taken from intact classes.

If the significant F-ratio for H_1 does in fact represent a difference in factor structure, perhaps it can be accounted for by variations in cultural background yet to be identified. Subsequent to the data analysis, it was discovered that the Hawaiian sample contained a number of subjects brought from Southeast Asia and from islands of the South Pacific by the East-West Center to learn a trade. The presence of these subjects may possibly account for the significant H_1 test as well as for the relatively less effectiveness of the IAS scales in discriminating among the Hawaiian curriculum groups. The items on the inventory may simply convey a meaning to such students which is different from that conveyed to either Hawaiians or Californians.

A cultural explanation could also account for differences in factor structure among native Hawaiian subjects. Stewart, Dole and Harris (1967) reported significant H_1 tests for achievement test scores among Hawaiian high school students. This observed difference in variance-covariance matrices appeared to be due mainly to the responses of Japanese students. There was also some indication of ethnic bias in selection of high school curriculum. Whether such a bias operated in the choice of junior college curricula by the subjects included in this study cannot be determined from data available to the investigator.

TABLE 61

Samples Used in Comparisons of Hawaiian and California Students

Accounting and Bookkeeping		36
Data Processing		58
Dental Assisting		13
Food Preparation and Service		18
Nursing, Vocational		51
Secretarial		107
	Total	283

TABLE 62

Multivariate Analysis of Variance of Mean IAS Scores for Hawaiian Students and a Random Sample of California Junior College Students

Variable	Hawaiian Students (N=283)	California Students (N=283)
Adventure	52.9	48.3
Order	44.9	44.6
Influencing Others	47.6	46.7
Nurturance	56.3	54.5
Concrete Means	43.2	46.2
Written Expression	39.6	37.5
Abstract Ideas	43.4	43.7
Aesthetic	50.8	47.6

Test for H_1: F 2.10 df 36, ∞
Test for H_2: F 8.29 df 8, ∞

FINDINGS--IDAHO SUBJECTS*

IAS data were obtained from students enrolled in six Idaho colleges during 1967-1968*. Data were also available on the OPI but unfortunately, a fourteen scale form, F, of the instrument was used with the Idaho subjects. Even scales with the same names are not identical to those on the form used with California students so that no direct comparisons on OPI scores can be made between the two samples.

Brief descriptions of the additional scales included in form F are presented below:

Religious Orientation (RO): High scorers are skeptical of conventional religious beliefs and practices and tend to reject most of them, especially those that are orthodox or fundamentalistic in nature. Persons scoring near or above the mean are manifesting a liberal view of religious beliefs, and low scorers tend to be conservative in general and rejecting of other viewpoints. (The direction of scoring on this scale, with strong religious commitment indicated by low scores, was determined in part by the correlation between these items and the first four scales which together measure a general intellectual disposition.)

Personal Integration (PI): The high scorer admits to few attitudes and behaviors that characterize anxious, disturbed or socially alienated persons. Low scorers on the other hand, may intentionally avoid others and often express hostility and aggressions. They also indicate feelings of loneliness, rejection, and isolation.

Anxiety Level (AL): High scorers deny that they have feelings or symptoms of anxiety. Low scorers are generally tense and high-strung and often experience some difficulty adjusting in their social environment.

Altruism (Am): The high scorer is an affiliative person and trusting in his relations with others. He exhibits concern for the feelings and welfare of people he meets. Low scorers tend to be much less concerned about the welfare of others and often view people from an impersonal, distant perspective.

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*The data reported in this section were made available through the courtesy of Dr. Kenneth M. Loudermilk, Director, State Occupational Research Unit, University of Idaho. The data were obtained as part of a larger research project conducted under grant number OEG-4-7-063014-1590 from the U.S. Office of Education, Department of Health, Education, and Welfare.

Practical Outlook (PO): The high scorer on this measure is interested in practical, applied activities and tends to value material possessions and concrete accomplishments. The criterion most often used to evaluate ideas and things is one of immediate utility. Authoritarianism, conservatism, and non-intellectual interests are very frequent personality components of persons scoring above the average.

Masculinity-Femininity (MF): This scale assesses some of the differences in attitudes and interests between college men and women. High scorers (masculine) deny interests in esthetic matters and they admit to few adjustment problems, feelings of anxiety, or personal inadequacies. They also tend to be somewhat less socially inclined than low scorers and more interested in scientific matters. Low scorers (feminine), besides stronger esthetic and social inclinations, also admit to greater sensitivity and emotionality.

Response Bias (RB): This measure represents an approach to assessing the student's test-taking attitude. High scorers are responding to this measure in a manner similar to a group of students who were explicitly asked to make a good impression by their responses to these items. Low scorers, on the contrary, may be trying to make a bad impression.

Altogether scores on the IAS were available for 463 subjects; for the OPI, 719. For analyses involving the IAS all curriculum groups of less than ten were eliminated thus leaving 14 groups as shown in Table 63. For the OPI all groups with less than 14 subjects were eliminated, leaving 17 groups as shown in Table 68.

IAS Scores

The first analysis performed with the IAS data was the stepwise multiple discriminant analysis. The results for 14 curricula are presented in Tables 63 and 64. The percentage of subjects correctly classified into their respective curricula varied from 0 to 50. Overall 24 percent of the subjects were classified--a proportion considerably below that found for California subjects and smaller than the 30 percent for the Hawaiian sample. This relatively small number correctly classified may be accounted for in part by the large number of curricula included in the single analysis. Undoubtedly the overlap of the several scales tended to mask differences between any certain criteria.

The results of the MANOV of IAS raw scores are presented in Table 65. Note that the F-ratio for H_1 was statistically significant, indicating possibility of differences in factor structure underlying the scores of the 14 criterion groups. This finding is consistent with those based on California and Hawaiian subjects. Also, there were significant differences in vectors or profiles of means scores for the various curricula.

TABLE 63

Percentage of Idaho Subjects Classified Correctly by IAS Scores

Curriculum	Number	Number Classified	Percentage Classified
Voc. Nurse	37	12	32
Dental Assistant	16	5	31
Secretarial	71	23	32
Drafting	40	16	40
Instrumentation	15	7	47
Office Machine Repair	29	6	21
Electronics	43	15	35
Machine Shop	28	0	00
Auto Mechanic	67	7	10
Auto Body	23	1	43
Welding	32	0	00
Diesel Mechanic	22	11	50
Police Technology	21	1	05
Middle Management	19	5	26

Total Correctly Classified	109
Total Percent Classified	24

TABLE 64

Summary of Stepwise Multiple Discriminant Analysis of IAS Scores -- Idaho Subjects

Step	Scale	F-Value	U-Statistic
1	Concrete	16.80	.67
2	Nurturance	15.10	.47
3	Aesthetic	5.43	.40
4	Abstract	4.34	.36

TABLE 65

Multivariate Analyses of Variance of IAS Scores Obtained from Idaho Sample

	IAS Scales							
Curriculum	Adv	Ord	Infl	Nurt	Conc	Writ Exp	Abst	Aes
Voc. Nurse	48.6	43.3	43.9	60.4	42.5	39.4	42.9	49.4
Dental Assistant	55.6	37.7	44.2	59.7	47.5	43.4	47.1	56.9
Secretarial	54.9	45.6	48.6	54.1	40.9	38.4	40.4	49.5
Drafting	55.4	36.7	42.4	40.4	55.2	32.3	50.2	49.6
Instrumentation	55.5	38.0	44.3	46.1	62.9	29.5	50.1	34.3
Office Mach. Repair	60.3	43.9	50.0	47.8	56.1	34.1	45.0	43.7
Electronics	58.3	41.0	44.0	45.0	63.8	34.0	55.4	39.2
Machine Shop	62.3	39.2	42.9	43.0	61.8	30.0	49.2	37.1
Auto Mechanic	53.9	37.9	45.1	42.5	53.1	33.4	44.7	37.4
Auto Body	65.7	39.3	46.9	43.4	55.4	34.7	44.6	43.6
Welding	58.0	36.3	43.2	43.0	57.7	28.0	44.3	37.1
Diesel Mechanic	60.5	37.8	39.3	40.0	59.1	26.1	38.2	31.2
Police Technology	54.3	38.2	49.2	49.9	46.3	37.1	43.8	37.5
Middle Management	51.3	46.6	53.6	52.5	48.2	48.1	50.0	47.0

Test for H_1: F 1.31 df 468, ∞ $P < .01$
Test for H_2: F 6.45 df 104, ∞ $P < .01$

Since the Concrete, Nurturance, Aesthetic, and Abstract scales were most effective in accounting for dispersion among the groups (Table 64), one would expect a considerable amount of variation in means on these scales among the several criterion groups. Inspection of the group of means in Table 65 indicates such to be the case. On the Concrete scale for example, the means of raw scores vary from 40.9 to 63.8. By contrast, the means on Order varied only from 36.3 to 46.6.

Are Idaho occupation-oriented students similar to those in California colleges? In order to investigate this question, a MANOV comparison was made between the two groups. For this analysis, it was possible to match two samples of 448 subjects as shown in Table 66.

The F-ratio for H_1 was not statistically significant (See Table 67). Therefore, it would appear safe to assume that the IAS provides a similar stimulus for California and Idaho subjects enrolled in similar curricula. However, the two samples did differ with respect to vectors of mean of IAS scores. The F-ratio for H_2 was significant beyond the .01 level. The nature of the differences in means can be seen in Table 67.

OPI Scores

The OPI scores (14-scale form), of 17 groups of Idaho curricula were analyzed by means of stepwise discriminant analysis. The numbers of subjects correctly classified are shown in Table 68. Over all, only 18 percent of the subjects were correctly classified. The percentage within the various criterion groups varied from 00 to 75. As with the other samples, the OPI seems to be less effective than the IAS for differentiating among groups of occupation-oriented students.

The relative importance of specific OPI scales is shown in Table 69. The largest proportion, 21 percent, of the dispersion among the criterion groups, is accounted for by Thinking Introversion. Masculinity-Femininity, Impulse Expression and Social Introversion account for 17, 9, and 5 percent, respectively.

The results of the MANOV of OPI scores are presented in Table 70. The F-ratio for both H_1 and H_2 is significant beyond the .01 level. Consistently with findings based on other samples, there is a strong possibility of difference in factor structure among criterion groups.

As indicated previously, because different forms of the test were employed, no comparisons on the OPI between Idaho and California students were possible.

TABLE 66

Samples Used for Comparison of Idaho and a Random Subsample of California Students

Curriculum	Number of Subjects
Licensed Vocational Nursing	37
Dental Assisting	16
Secretarial	71
Industrial Drafting	40
Business Equipment Technology	29
Machinist	28
Auto Mechanic	67
Auto Body and Fender Repair	23
Welding	32
Diesel Mechanic	22
Police Science	21
Business Administration	19
TOTAL	448

TABLE 67

Multivariate Analyses of Variance of IAS Scores Comparison Samples of Idaho and California Students (448 Subjects in Each Group)

	Idaho	California
Adventure	56.3	55.1
Detail	40.6	40.1
Influence	45.6	44.7
Nurturance	47.6	48.6
Concrete	52.3	55.5
Written	35.0	33.1
Abstract	45.6	45.2
Aesthetic	43.1	44.3

Test for H_1: F 1.29 df 36, ∞ $P > .05$
Test for H_2: F 6.57 df 8, ∞ $P < .01$

TABLE 68

Idaho Subjects Correctly Classified by OPI Scores

Curriculum	Number	Number Classified	Percent Classified
Vocational Nurse	31	11	35
Secretarial	62	33	53
Drafting	41	1	02
Instrumentation	14	3	21
Office Machine Repair	27	2	07
Electronics	35	6	17
Machine Shop	25	4	16
Auto Mechanic	54	0	00
Auto Body	17	6	35
Welding	33	0	00
Diesel Mechanic	18	4	22
Police Technology	20	4	20
Middle Management	19	1	05
Vocational	103	12	12
Academic	107	23	21
"Joe College"	97	11	11
Non-Conformist	16	12	75

Total Number Classified	133
Total Percent Classified	18

TABLE 69

Summary of Stepwise Discriminant Analyses of OPI Scores - Idaho Subjects

Variable	F-Value	U-Statistic
Thinking Introversion	12.0	.79
Masculinity-Femininity	11.9	.62
Impulse/Repression	6.9	.53
Social-Introversion	4.8	.48

TABLE 70

Multivariate Analysis of Variance of OPI (Form Fx) Scores -- Idaho Subjects

	Mean OPI Scores* (listed in order left to right)						
Curriculum							
Voc. Nurse	19.8	14.6	11.2	12.6	19.8	10.4	23.0
(31)	26.7	33.6	12.8	21.9	18.3	26.8	11.8
Secretarial	17.4	14.5	10.9	13.5	18.0	9.8	23.8
(62)	30.4	29.6	11.8	20.0	18.8	24.5	10.0
Drafting	18.7	18.7	8.3	15.7	21.5	12.8	18.2
(41)	33.4	29.8	12.2	16.5	17.5	35.0	11.4
Instrument.	18.9	17.9	7.1	11.5	16.6	11.1	19.5
(14)	30.6	31.9	12.8	15.6	21.1	36.4	13.2
Office Mach.	19.7	18.6	8.6	13.6	20.0	11.6	21.3
Repair (27)	34.7	31.6	13.1	18.2	19.4	34.0	12.7
Electronics	19.5	21.3	7.7	14.9	22.4	12.5	22.0
(35)	34.6	32.5	13.4	17.6	17.7	36.3	12.7
Machine Shop	18.0	18.4	6.4	14.7	20.6	12.8	17.1
(25)	33.8	29.8	13.4	16.0	18.2	36.0	11.3
Auto Mechanic	15.7	16.3	7.6	14.7	20.7	14.4	18.4
(54)	35.7	27.9	12.0	15.2	19.2	34.4	9.9
Auto Body	17.3	16.6	8.7	14.7	20.6	13.0	17.6
(17)	41.3	25.2	11.6	14.8	19.7	33.5	9.8
Welding	16.2	16.7	7.2	13.4	19.4	13.1	18.9
(33)	35.5	30.2	12.0	15.2	20.1	34.1	10.3
Diesel Mech.	14.7	14.8	6.4	14.6	17.9	12.9	17.8
(18)	37.8	25.7	12.1	12.9	20.9	34.7	7.6
Police Tech.	19.0	17.2	8.0	14.6	18.7	10.2	23.1
(20)	36.2	35.5	12.9	20.6	18.2	33.6	11.8
Middle Manage.	20.2	17.7	9.5	15.7	20.8	11.5	23.1
(19)	34.7	28.1	11.3	18.2	18.2	31.4	10.8

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*The fourteen scales in order of listing are TI, TO, ES, Co, Au, RO, SE, IE, PI, AL, Am, PO, MF, and RB.

TABLE 70 (Cont.)

Vocational	20.7	18.1	8.3	12.9	21.0	11.0	20.9
(103)	26.4	33.0	13.3	19.7	18.4	32.8	13.0
Academic	25.2	19.7	10.6	15.2	22.6	11.7	22.5
(107)	29.4	31.6	12.6	20.3	15.8	31.2	13.8
"Joe College"	20.2	18.2	8.2	13.8	22.7	11.6	24.4
(97)	30.1	31.9	12.8	19.9	17.6	33.0	12.7
Non-Conformist	33.1	21.8	14.6	22.1	31.0	15.6	19.1
(16)	37.3	23.6	9.1	18.1	10.8	28.4	10.9

Test for H_1: F 1.40 df ∞, ∞ $P < .01$
Test for H_2: F 3.61 df $224, \infty$ $P < .01$

FINDINGS--ACADEMIC ABILITY AND GRADES

Grades

Grade point averages for California students, computed on a 4-point scale, were obtained from official college records. The grades were analyzed by means of simple analysis of variance, the comparison groups being the seven a priori clusters. The averages were necessarily based on different numbers of courses since samples included both first and secnnd year students.

The results of the analysis are shown in Table 71. Note that the obtained F-ratio of 18.49 is significant well beyond the .01 level. It is apparent that the clusters differ in academic performance. Cluster I was lowest with a mean of 2.09; Cluster II was highest, 2.61.

Academic Aptitude

Academic aptitude scores were obtained from school records for 1327 California students. Three tests, the School and College Ability Tests (SCAT), the American College Test (ACT), and the American College Psychological Examination (ACE) were used in the colleges from which subjects were obtained. The problem of equating the scores from different tests is difficult to resolve.

Rough tables for establishing equivalence among the various tests have been devised by Darley (1962). These tables were used along with the SCAT Manual to covert all scores to SCAT raw score equivalents. These raw scores were then analyzed by MANOV. As in the analysis of GPA, the criterion groups consisted of the seven a priori clusters.

The results are shown in Table 72. As was expected, there was considerable variation among the vectors of mean scores of the various clusters. Clusters II and VII were lowest; III and VI highest. There was also considerable variation in the relative importance of quantitative and verbal acores. For example, Cluster III, composed mainly of medical technicians, tends to have relatively high verbal scores. On the other hand Cluster V, containing a number of high level industrial technicians, tends to have relatively higher quantitative scores.

The unexpected finding was the highly significant F-ratio for H_1--indicating perhaps a difference in underlying factor structure for the criterion groups. There is little, if any, evidence in testing literature which would lead one to expect tests of academic aptitude to present differing stimuli to the various curriculum groups. Therefore, the observed significant F-ratio may well have resulted from the procedures used to convert scores from the several instruments to SCAT equivalents.

TABLE 71

Analysis of Variance of GPA of A Priori Clusters

	Cluster						
	I	II	III	IV	V	VI	VII
N	92	242	327	562	561	319	152
Mean	2.09	2.61	2.54	2.26	2.26	2.41	2.46
SD	.45	.70	.55	.73	.62	.61	.67

	Sum of Squares	DF	Mean Square	F
Between Groups	46.18	6	7.70	18.49
Within Groups	935.69	2248	.42	
Total	981.88	2254		

TABLE 72

Multivariate Analysis of Variance - Scat Equivalents Classified According to A Priori Clusters

Cluster	N	Verbal	Quantitative	Total
I	70	26.8	27.0	53.4
II	114	23.4	20.5	44.2
III	254	34.6	27.1	62.1
IV	303	27.3	27.2	54.5
V	343	28.4	32.1	60.8
VI	200	31.2	31.7	62.8
VII	43	22.3	28.3	49.9

Test for H_1: F 14.7 df $36, \infty$
Test for H_2: F 20.1 df $18, \infty$

To check on this possibility the data were reanalyzed using only subjects for whom SCAT scores were available. The results are shown in Table 73. The evidence concerning H_2, the test of significance of differences in profiles of mean scores, is not greatly different from that based on the total sample. Also the F-ratio for H_1 (32.6) is again highly significant. Thus, as was true with the interest and personality measures, the possibility that the factor underlying ability scores differs from one occupation-centered group to another must be seriously entertained.

TABLE 73

Multivariate Analysis of Variance Scat Scores Only

Cluster	N	Verbal	Quantitative	Total
I	21	28.3	26.1	54.4
II	78	21.9	18.4	40.8
III	175	33.3	26.1	60.2
IV	195	26.7	26.0	52.6
V	257	28.0	31.6	59.9
VI	100	31.7	30.9	62.6
VII	15	19.3	23.9	43.2

Test for H_1: F 32.6 df 36, ∞
Test for H_2: F 14.2 df 18, ∞

CONCLUSION

The findings of this study reinforce the findings of the pilot study (Stewart 1966) which led to the reaearch described in this report. Students enrolled in various occupation-centered curricula in California junior colleges differ with respect to interest dimensions, to personality variables, to measures of academic aptitude, to academic achievement, to attitudes toward academic achievement and v ocational goals, and to home background factors. There is evidence in the findings that with minor exceptions, students currently enrolled are quite similar to graduates who have entered occupations appropriate to their junior college preparation. Hawaiian students differ with respect to interests. Idaho students differ with respect to interests and personality factors.

Although the findings of this study represent only a beginning on the vast task of defining the characteristics of students enrolled in occupation-oriented curricula, they lead at least to one important conclusion. Choice of curriculum for these students tends to be a systematic process as indicated by the fact that students with like attributes tend to make similar decisions. This is indicated by the fact that from one-third to well over 40 percent, depending on how criterion groups are established, can be classified into broad clusters of curricula from interest scores alone. Of course there is a considerable degree of overlap among various curricula on all measures. But considering the seemingly haphazard manner of admitting students to the various curricula and the lack of meaningful information about occupation-oriented curricula available to high school counselors, the degree of homogeneity within a curriculum group is especially noteworthy.

Research with the Strong Vocational Interest Blank has indicated that interests of professional and business men can be more clearly differentiated than can the interests of those in non-professional occupations. Darley and Hagenah (1955) suggest that this is so because the higher level occupations are intrinsically interesting; individuals at the lower status occupations choose them for factors other than interest--factors such as security and the like. But findings based on the Strong Blank may lead to erroneous conalusions about the interests of non-professional men. Strong developed his scales by comparing the responses of business and professional criterion groups against a reference group representing men employed at the same level. Why should the Strong Blank be expected to differentiate interests of non-professional men?

The findings of this study as well as the research of Clark with the Minnesota Vocational Interest Inventory (1961) clearly show that interests of non-professional men, especially those employed at the skilled-technical level, can be differentiated. Theories designed to explain vocational choices at this level of the occupational hierarchy must give due recognition to the importance of interests in the decision process.

The Omnibus Personality Inventory was designed to study characteristics of four-year college and university students. In this study it was relatively less effective than the Interest Assessment Scales in differentiating the curriculum groups. Combining the IAS and the OPI added very little, only three percent, to the number of California students correctly classified into the respective curriculum clusters. It may well be that the OPI simply is inappropriate for use with these occupation-oriented students or it may be that the interest variables are more salient factors in the choice of area of study than are the personality variables. In view of the mounting evidence with the IAS, the second explanation seems to be more plausible. Incidentally, the IAS was not developed specifically for use with occupation-oriented students or with non-professional workers. Nevertheless, it seems to measure effectively variables important in the choice of non-professional types of occupations. This is especially important since the IAS scores also differentiate junior college students in occupation-centered courses from those intending to transfer to four-year colleges and universities.

Other than demonstrating the importance of interests in curriculum decisions, the stepwise discriminate method of analysis used in this study offers little practical information that is immediately useful to the junior colleges. If one were concerned with only two criterion groups, A and B, it would be easy to weight scores on the IAS or OPI in such a manner so as to indicate that a subject belongs to Group A rather than to Group B. But when more than two groups are concerned simultaneously, the process of making prior judgements as to which group a subject belongs in becomes exceedinly difficult, and would not be feasible without the use of high-speed computers. Of course, the stepwise feature is important in identifying measures which are likely to be useful in any prediction battery.

Perhaps the most immediately useful analysis employed in this study is the multivariate analysis of variance. The vectors or profiles of mean scores of the various curricula or clusters of curricula provide a normative base against which an individual's score can be related. The method of comparison suggested here is similar to interpretation aids prepared by Science Research Associates for use with the Iowa Tests of Educational Development. These aids permit the comparisons of an individual's scores with mean scores of various norm groups such as majors in home economics who earned "B" grades. Even though the number of subjects for each of the curricula is fairly small, comparison of an individual's profile of scores with the various vectors of means would provide rough indices of appropriateness of interests for curriculum decisions. Hopefully more satisfactory norm groups will be developed in the near future.

Further study is under way to make the data obtained in this research more useful for counseling and placement of occupation-oriented students. Although not part of this contract, attempts are now being made to develop computer programs which will--when scoring the IAS or OPI--automatically compute some index of relationships between the subject's scores and each of the vectors of mean scores for the 43 curriculum groups, or for a cluster of curricula. Presumably an individual who normally would be correctly placed with respect to his chosen curriculum would have a higher index of relationships with the array of means for that curriculum or cluster than with the array for any other group.

During the analysis of the data in this study, a problem was encountered which may have serious implications for use of information obtained from instruments such as the IAS and the OPI. For the IAS there were rather consistant significant differences among the variance-covariance matrices for the various curricula and for the clusters. The differences were especially pronounced in the comparisons between California and Hawaiian subjects. The differences were not so pronounced with the OPI but there were significant differences, especially in comparisons among clusters of curricula. Significant differences were also noted on the measures of academic aptitude.

The problem stems from the possibility that such differences may well represent differences in underlying factor structure from group to group, i.e., the items present different stimuli to subjects enrolled in different curricula and from different cultural backgrounds. If the observed differences do in fact represent variations in factor structure, then there would be serious reservations about comparing scores of one criterion group with those of another. Stability of factor structure among criterion groups is a topic that has been ignored largely in testing literature, but which is need of systematic study.

Although the findings of this study indicate that graduates who enter employment for which their junior college preparation was relevant are similar to currently enrolled students, there are no data relevant to job performance, job satisfaction, or job success. Providing information which shows the relationship of the predictor variables used in this study to these ultimate criteria would appear to be a logical extension of the present research.

References

Anderson, T. W. *An introduction to multivariate statistical analysis*. New York: John Wiley, 1958.

Center for the Study of Higher Education. *Omnibus Personality Inventory*. Berkeley: University of California, 1962.

Clark, B. R. *The opendoor college*. New York: McGraw-Hill, 1960.

Clark, K. E. *Vocational interests of nonprofessional men*. Minneapolis: University of Minnesota Press, 1961.

Conant, J. B. *Education for the atomic age*. New York: Colliers Encyclopedia, 1959.

Cooley, W. W. and Lohnes, P. R. *Multivariate procedures for the behavioral sciences*. New York: John Wiley, 1962.

Darley, J. G. *Promise and performance: A study of ability and achievement in higher education*. Berkeley: Center for the Study of Higher Education, 1962.

Darley, J. G. and Hagenah, T. *Vocational interest measurement: Theory and practice*. Minneapolis: University of Minnesota Press, 1955.

Flanagan, J. C. Project talent: The first national census of aptitudes and abilities. *The 17th yearbook national council on measurements used in education*. 1960.

Friedman, H. P. and Rubin, J. On some invariant criteria for grouping data. *J. Amer. Stat. Assn.* 1967, *62*, 1159-1178.

Gardner, E. F. and Thompson, G. C. *Social Relations and Morale in Small Groups*. New York: Appleton-Century Crafts, 1956.

Holderman, K. L. *Gas and oil J*. 1957 (Nov. 25), 63.

Larson, M. E. *Review and synthesis of research in technical education*. Columbus: Center for Research and Leadership Development in Vocational and Technical Education, 1966.

Linn, R. L. and Davis, J. A. *Correlates of academic performance of community college students in career or transfer programs: A pilot study*. Princeton: ETS Research Bulletin, RDR-66-7, No. 2, 1966.

Medsker, L. L. *The junior college*. New York: McGraw-Hill, 1960.

Meredith, W. Notes on factor invariance. *Psychometrics*, 1964, *29*, 177-185.

References (Cont.)

Panel of Consultants on Vocational Education. *Education for a changing world of work*. Washington: U.S. Govt. Printing Office, 1963.

Ronning, R. R., Stellwage, W. R., and Stewart, L. H. *Application of multidimensional and scale analysis to interest measurement*. Report, Cooperative Research Project 1493, U.S. Office of Education, 1963.

Stewart, L. H. Characteristics of junior college students in occupationally-oriented curricula. *J. Counsel. Psychol*. 1966, 13, 46-52.

Stewart, L. H., Dole, A. A., and Harris, Y. Y. Cultural differences in ability during high school. *Amer. Educ. Res. J*. 1964, *4*, 19-29.

Stewart, L. H. and Ronning, R. R. *Multidimensional analysis of an experimental measure of interest*. Report, Cooperative Research Project 2204, U.S. Office of Education, 1964.

Stewart, L. H. and Workman, A. D. *Mathematics and science competencies for technicians*. Sacramento: Bulletin of the Calif. State Dept. of Education, *XXIX*, 1960.

Strong, E. K. Jr. *Vocational interests of men and women*. Palo Alto: Stanford University Press, 1943.

Thomte, K. A. Certain characteristics of full-time students enrolled in trade and industrial education in high schools and junior colleges of selected California communities. Unpublished doctoral dissertation, University of California, Berkeley, 1961.

Torgerson, W. S. *Theory and methods of scaling*. New York: John Wiley, 1958.

Trent, J. W. and Medsker, L. L. *Beyond high school*. Berkeley: Center for Research and Development in Higher Education, University of California, 1967.

Tryon, R. C. *et.al*. *BC TRY Computer system of cluster and factor analysis users manual*. Berkeley: University of California, 1964.

Wilks, S. S. Sample criteria for testing equality of means, equality of variances, and equality of covariances in a normal multivariate distribution. *Ann. Math Stat*. 1946, *17*, 257-281.

Williford, E. A. The engineering technician: His role in industry and national defense. *Engin. Educ*. 1957, *XLVII*, 436-442.

Appendix A

Computational Formulas for Statistics Appearing in Stepwise Discriminant Summary Tables*

U and " Approximate F" statistics computed under usual normality conditions.

U-Statistics

Let W be the within, T be the total cross-product matrix, where

$$W = \{w_{ij}\} \qquad T = \{t_{ij}\}$$

$$w_{ij} = \sum_{m=1}^{q} \sum_{k=1}^{n_m} (x_{mki}-\bar{x}_{mi})(x_{mkj}-\bar{x}_{mj})$$

$$t_{ij} = \sum_{m=1}^{q} \sum_{k=1}^{n_m} (x_{mki}-\bar{x}_{i})(x_{mkj}-\bar{x}_{j})$$

p = number of original variables $\quad i = 1,\ldots,p$
$\quad j = 1,\ldots,p$

Assuming that the first r variables are included in the discriminant function

$$W_{11} = \begin{bmatrix} w_{11} & \cdots & w_{1r} \\ \vdots & & \vdots \\ w_{r1} & \cdots & w_{rr} \end{bmatrix} \quad \text{and} \quad T_{11} = \begin{bmatrix} t_{11} & \cdots & t_{1r} \\ \vdots & & \vdots \\ t_{r1} & \cdots & t_{rr} \end{bmatrix}$$

$$U = \frac{\mathrm{DET}\ (W_{11})}{\mathrm{DET}\ (T_{11})}$$

with degrees of freedom (r, g-1, n-g).

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* From BMD Biomedical Computer Programs (Revised 1965), School of Medicine, University of California, Los Angeles.

Approximate F-Statistics

$$F = \frac{1 - U^{1/s}}{U^{1/s}} \; \frac{ms + 1 - rq/2}{rq} \qquad \text{where}$$

$$s = \sqrt{\frac{r^2q^2 - 4}{r^2 + q^2 - 5}} \qquad \text{if} \qquad r^2 + q^2 \neq 5$$

$$s = 1 \qquad \text{if} \qquad r^2 + q^2 = 5$$

$$m = n - \frac{r + q + 3}{2}$$

$$q = g-1$$

Appendix B

Occupation-Centered Curricula Study

University of California, Berkeley

QUESTIONNAIRE

1. Name____

2. Permanent Address________________________________

____

3. Date of birth____________________

4. Sex (check one) (1) _____male (2) _____female .

5. If you are now employed, what is the title of your job? __________

____

Describe just what you do______________________________

____

6. If you have graduated from a junior college, please give following information:

(a) name of school ______________________________

(b) address __________________________________

(c) approximate size of graduating class ________________

(d) what was your field of study? ____________________

7. How good, in general, were your high school grades? (check one)

(1) _____ in the top quarter of your class

(2) _____ in the second quarter of your class

(3) _____ in the third quarter

(4) _____ in the lowest quarter

8. What are (or were) your parents' most recent jobs?

Father's job: ______________________________
(for example, machine operator, school teacher, etc.)

Just what does or did he do? ______________________________

____

Mother's job: ______________________________
(for example, machine operator, school teacher, secretary, etc.)

Just what does or did she do? ______________________________

____

9. Most of my friends (check one):

_____ 1. dropped out of high school before graduating
_____ 2. graduated from school and got a job
_____ 3. entered junior college to learn a trade
_____ 4. entered junior college with plans to transfer to a state college or university
_____ 5. entered military service
_____ 6. entered a four-year college
_____ 7. other

10. How far did your parents get in school?

Father ____________________ Mother ____________________

11. If you are now enrolled in junior college, what is your field of study?

____

How sure are you that you will continue in this field? (check only one)

(1) _____very sure
(2) _____quite sure
(3) _____somewhat unsure
(4) _____not at all sure

12. Suppose that in about 15 years, with hard work, you could make good in whatever job you chose. What job would you choose?

____

13. Please tell as near as you can remember when you decided what field of work to enter. (check one)

(1) _____ before junior high school
(2) _____ during junior high school (grades 7-9)
(3) _____ during senior high school (grades 10-12)
(4) _____ in junior college
(5) _____ I have not yet decided

14. If you had your choice, which of the following kinds of jobs would you pick? (check one)

(1)_____ a job which doesn't pay much money but which you were sure of keeping
(2)_____ a job which pays good money but which you have a 50-50 chance of not being able to hold down
(3)_____ a job which pays real good money if you can keep it, but one in which chances of failure are high

15-16. If you were back in high school now, what would you do differently? (check as many as apply)

1. ______ Take a college preparatory program
2. ______ Take a vocational program
3. ______ Take a business program
4. ______ Take a general program
5. ______ Study harder or get help on study problems
6. ______ Learn more about chances for certain jobs
7. ______ Ask help from teachers or counselors with my problems
8. ______ Choose different friends
9. ______ Take more active part in out-of-class activities
10. ______ Take less active part in out-of-class activities
11. ______ Take different subjects in the same program
12. ______ Take high school more seriously
13. ______ Would not do anything differently
14. ______ Other; tell what: ____________________________________

17. What three activities in your life do you expect to give you the most satisfaction? Please write a . . .
"1" next to the most important
"2" next to the second most important
"3" next to the third most important
Place an "0" next to the least important

1. ______ Occupation or job
2. ______ Making money
3. ______ Marriage and family life
4. ______ Leisure time play activities; hobbies, outdoor living, sports
5. ______ Religious activities

17. (Cont.)

6. ______ Taking part in affairs of your community
7. ______ Taking part in activities directed toward making world conditions better
8. ______ Literature, art, or music
9. ______ Other; tell what: ______________________________

18. Before each of the following vocations put the number that tells what you as a high school senior, thought were your chances of success in that vocation

1. no chance 2. slight chance 3. fair chance 4. very good chance

____ skilled craftsman (carpenter, painter, mechanic, etc.)
____ managerial (business position, etc.)
____ unskilled laborer
____ high-level professional (doctor, lawyer, etc.)
____ service (domestic, railroad porter, etc.)
____ athlete (ball player, etc.)
____ semiskilled worker (assembly-line worker, etc.)
____ white-collar worker (sales clerk, etc.)

19. As a high school senior, what did you think your chances of success were in the following types of schools? (Place the number which gives your chances before each type of institution.)

1. no chance 2. slight chance 3. fair chance 4. very good chance

____ junior college with idea of changing later to 4-year college or university
____ junior college (job program)
____ state college
____ University of California
____ private college or university

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RETRIEVAL TERMS
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Student Characteristics
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Interests
Achievement
Aptitude
Apprentices
Graduates
Biographical

IDENTIFIERS

ABSTRACT

Personality interest and ability variables differentiated among California junior college students enrolled in occupation-centered curricula. Analytical techniques used were Stepwise Discriminant Analysis and Multivariate Analysis of Variance. Hawaiian students were differentiated on interest measures; Idaho students, on interest and personality factors. Apprentices appeared to be like currently enrolled students. There were some relatively small differences between students and graduates. Interests of Hawaiian students tended to be quite different from those in California. Significant differences in variance-covariance matrices indicated possible instability of factor structure underlying test scores of criterion groups.